

Probing systems for CNC machine tools



Introduction









The invention of the touch trigger probe in the early 1970s revolutionised the development of the CMM (co-ordinate measuring machine) as the industry standard for 3D measurement.

Although the potential for applying probe routines on machine tools was quickly realised, it was not until the mid-1980s and development of more sophisticated machine controls, that probing became adopted by the world's largest machine tool builders.

Historically, there had been a marked reluctance by users of machine tools to use probing; typical objections included "increased cycle times" and "machine tools are for cutting not for measuring". Both sentiments were largely based on misconceptions as to the real applications and benefits of probing, and also entrenched attitudes to improvements in methods of machine tool operation.

Today, the acceptance of quality control in the production environment, and drive towards maximising machine productivity, has finally seen probing accepted as standard practice in the field of production engineering.

Applications

Tool setting

Using slip gauges and entering offset data manually takes time and is prone to operator error. Tool setting probe systems are easily installed on machining centres and CNC (computer numerically controlled) lathes and allow automated operation with the following benefits:

- Significant time savings with reduced machine downtime
- Accurate tool length and diameter measurement
- Automatic tool offset calculation and correction
- · Elimination of manual setting errors
- In-cycle tool breakage detection

Part set-up

Probing eliminates the need for expensive fixtures and manual setting with dial indicators. Probes are spindle-mounted on machining centres and turret-mounted on lathes, providing the following benefits:

- Reduced machine downtime
- Automatic fixture, part alignment and rotary axis set-up
- Elimination of manual setting errors
- Reduced scrap
- Increased productivity and batch size flexibility

Part inspection

Spindle and turret-mounted probes can also be used for in-cycle gauging and first-off inspection – manual gauges rely on operator skill and the removal of parts to CMMs is not always practical. Benefits include:

- In-cycle part measurement with automatic offset correction
- Increased confidence in unmanned machining
- First-off inspection with automatic offset update
- Reduced machine downtime from awaiting first-off results



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How to use this guide

This document has been designed to help you to select the ideal probing system for your machine tool application.

Renishaw's broad product range covers inspection and tool setting applications on CNC machining centres, lathes and grinders, and manual milling machines.

Comprehensive probing software, styli and accessories cater for every probing need. Where a standard product may not suit your exact requirements, Renishaw's custom design service is available to tailor a solution.

Probe system selection

The type of probing system that you need will depend on your machine tool and the nature of the probing application.

This document contains sections that focus on the main applications for probing on machine tools (see sections 3, 4, 5 and 6). At the start of each section is an introduction to the use of probing for that application, plus guidance on selection of the most appropriate system. The remainder of the section contains technical information about each probe.

For inspection probing systems, you also need to consider the type of transmission system that you require. Once again, this decision will depend on the size and configuration of your machine tool.

Selection procedure

Step 1

Which probing application do you require?

- 1. Inspection / part set-up Go to Step 2.
- 2. Tool setting / broken tool detection Go to Step 3.

Step 2

What type of transmission do you require for your inspection probing system?

Go to section 2 (Transmission selection), to identify the best transmission system for your machine tool. An overview will help you to choose, with a detailed specification of transmission performance on the subsequent data pages.

Step 3

Which probe is best for your application?

Go to the appropriate section (3, 4, 5 or 6) for your application. On the first page is an overview of Renishaw's products and a guide for probe selection. If no standard product meets your requirement, refer to section 11 (Custom design service).

Step 4

Check the probe details.

Check the technical information listed on the data page for the probe that you have selected to ensure that it meets your requirements. If yours is an inspection probing application, check that the probe can operate with the transmission system that you have chosen.

Step 5

Check the interface details.

The probe data page defines the compatible electrical interface unit for your chosen probe. Go to section 7 (Machine interface units) to check that the interface is suitable for your machine tool controller.

Step 6

Identify your shank adaptor requirements.

Section 8 (Shank adaptors) will help you either to make your own shank adaptor, or to choose from Renishaw's range of standard items.

Other accessories Styli

Renishaw probes are supplied with styli suitable for most applications. Section 9 (Styli and accessories) gives further information on Renishaw's stylus range. For full details, refer to Renishaw's technical specification *Styli and accessories* (part no. H-1000-3200).

Software

Renishaw has a comprehensive range of probing software packages suitable for most probing applications. Check section 10 (Software) to see whether suitable probing software is available for your machine tool controller.

For more details of Renishaw's probing software, refer to the data sheets *Probe software for machine tools – program features* (part no. H-2000-2289) and *Probe software for machine tools – program selection list* (part no. H-2000-2298).

Overview

A Renishaw probe must be able to communicate with the control system (CNC) of the machine on which it is fitted. Signals must pass from the probe to the machine's controller to register contact of the probe's stylus with the component or tool. Similarly, signals must pass from the machine's controller to the probe to control the functioning of the probe.

The passage of these signals is handled by a **transmission system**. The choice of transmission system depends on the type of probe and the type of machine tool to which it is fitted.

Inspection probes for machining centres are typically located in a tool carousel and are interchanged like conventional tools. On lathes, the probe is typically a semipermanent feature of a rotating turret. In both case, signalling between probe and CNC generally has to be remote.

For **tool setting** applications, typically the probe is mounted in a fixed location, thereby allowing direct communication between probe and CNC.

Renishaw probes use four main types of transmission systems:

- Optical
- Radio
- Inductive
- · Direct or 'hard-wired'

The following sections show typical examples of each of these systems:



Optical transmission systems

Overview

An optical transmission system uses infra-red technology for communicating between the probe and the CNC controller and comprises the following:

Probe module

The probe receives machine control signals and transmits probe status signals. There are two active modes, "standby" and "operating". In "standby" mode the probe is a receiver waiting for a signal to switch to operating mode. In "operating mode" it transmits probe information to the OMM receiver. Probe battery status information is also transmitted in the same manner.

• Optical machine module (OMM)

The OMM is the reception/transmission communication partner for the probe module. It is hard-wired to a machine interface unit.

• Machine interface unit (MI12)

The interface converts probe signal information into a form which is compatible with the machine controller. In addition, it has visual and/or audible indicators for probe status, system power, battery status and error diagnostics.

• Optical machine interface (OMI)

The functions of the OMM and MI12 have been combined into a single module, the **optical machine interface (OMI)**, offering functionality specifically optimised for the needs of smaller machine tools.

Optical machine interface (OMI-2)

This is a new-generation optical receiver/interface that uses modulated optical transmission for the rejection of light interference.



Applications

• Inspection systems on small to large sized machining centres and lathes.

(See pages 2.4, 2.5 and 2.8 to 2.16 for further information).

Radio transmission



Overview

A radio transmission system provides long range (up to 15 m path length) of communication between the probe and the machine's controller. The system hops between channels, within the designated frequency band. The use of unique identifiers allow multiple radio systems to operate in close proximity. Radio probes are classified as short range devices and meet the requirements for licence-free operation.

A radio transmission system comprises the following:

Probe

The probe receives machine control signals and transmits probe status signals. There are two active modes, "standby" and "operating". In "standby" mode the probe is a receiver waiting for a signal to switch to "operating mode". In "operating mode" it transmits probe status information to the RMI receiver.

Probe battery status information is also transmitted in the same manner.

• Machine interface (RMI)

The combined interface and antenna converts probe signal information into a form which is compatible with the machine's controller. In addition, it has visual indicators for start, low battery, probe status, error and signal strength.

Applications

• Workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes (VTL).

Inductive transmission systems



Overview

Inductive transmission works by passing power and probe signals across a small air gap between two induction modules. Typically, a probe fitted with an inductive transmission system comprises the following:

- Probe and inductive probe module (IMP), mounted on a shank. The IMP receives power from, and passes probe signals to, the IMM.
- Machine module (IMM) communicates with the IMP. Mounted on the machine tool's spindle nose, the IMM is 'hard-wired' to a Machine Interface Unit.
- Machine interface unit (MI5) converts probe signals into a form which is compatible with the machine tool's controller. The interface also has visual and audible indicators of probe status.

Applications

 Inspection systems on machining centres and lathes. Inductive transmission is only suitable for fitting by machine builders.

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Hard-wired transmission systems

An example of a contact tool setting system



Overview

A hard-wired probe system has the simplest form of transmission system and typically, comprises the following elements:

- **Signal cable** connects the probe to a machine interface unit, carrying power and probe signals.
- Machine interface unit (MI8) converts probe signals into a form which is compatible with the machine tool's controller. The interface also has visual indicators for probe status and error diagnostics.

Applications

Hard-wired transmission systems are ideal for the following applications:

- Tool setting on machining centres and lathes where the probe remains in a fixed location (see pages 4.3 to 4.8).
- Inspection on milling machines where the probe is manually placed in the machine spindle.

For further details of hard-wired transmission systems, refer to section 7 (Interfaces).

OMI/OMM/OMME

The OMI and OMM are optical transmitter/receivers which convey signals between a probe system and the CNC machine's control.

The OMI differs from the OMM by including machine interface circuitry which processes signals and can therefore be connected directly to the machine's control. The physically identical OMM requires an additional MI12 interface unit. Two OMMEs are typically used in conjunction with an MI12E interface.

All units contain LEDs which transmit and receive signals to and from the probe. There are also LEDs which indicate probe status, start signal status, battery condition and error condition.



OMI = 84 (3.30) OMM/OMME = 86 (3.38)



All dimensions are in mm (in).



| | ОМІ | ОММ | ОММЕ |
|-----------------------------------|--|--|---|
| PRINCIPAL APPLICATION | Small sized machining centres and lathes | Medium sized machining centres and lathes | Large and 5-axis machining centres |
| TRANSMISSION TYPE | Infra-red optical transmission | Infra-red optical transmission | Infra-red optical transmission |
| CABLE | Screened, 12-core x 8 m long | Screened, 5-core x 25 m long | Screened, 5-core x 25 m long |
| MOUNTING | A mounting bracket is available allowing directional setting | | |
| SEALING | IPX8 | IPX8 | IPX8 |
| COMPATIBLE INTERFACE [¥] | OMI does not require an additional interface | OMM requires MI12 Note that two OMMs can be connected to a single MI12 | OMME requires MI12E Note that two OMMEs can be connected to a single MI12E |
| SUITABLE PROBES [†] | OMP40, MP10, MP12 and MP700 for machining centre inspection applications LTO2S, LTO2T, LTO3T and LTO2 for lathe inspection applications | | MP10E and MP700E |

¥ See INTERFACES section for more details.

† See relevant application sections for more details.

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OMI-2 for use with OMPs with modulated optical transmission

The OMI-2 is a combined optical receiver/interface, which conveys and processes signals between an inspection probe and the CNC machine control.

The OMI-2 is compatible for use with optical machine probes that utilise Renishaw's state-of-the-art modulated optical transmission method, to provide the highest level of resistance to light interference.

All dimensions are in mm (in).





100.5 (3.95) 2.0 (0.08) 30 (1.18) 4 à 0 25 (0.98) Adjustable setting 45 (1.7) 6 × paired holes Ø5.3 (Ø0.20) permit OMI-2 mounting in an alternative orientation 45° 45 (1.77) 2.0 (0.08) 90 (3.54)

| | OMI-2 |
|------------------------------|---|
| PRINCIPAL APPLICATION | Workpiece measurement and job set-up on small-to-medium sized machining centres and lathes. |
| POWER SUPPLY | 12 V to 30 Vd.c Alternatively, power may also be supplied from a Renishaw PSU3 power supply |
| MOUNTING | Mounting bracket optional for side-exit configuration, to allow directional setting |
| CABLE | The OMI-2 standard cables are 8 m (26 ft) and 15 m (49 ft) long. Cable specification: \emptyset 7.5 mm (0.29 in), 13-core screened cable, each core 18 × 0.1 mm |
| SEALING | IPX8 |
| COMPATIBLE INTERFACE | The OMI-2 does not require an additional interface |
| SUITABLE PROBES [†] | OMP60 |

† See relevant application sections for more details.

Mounting bracket - allows OMI-2 directional setting

RMI interface for use with the RMP60 probe

The RMI is a combined transmitter and receiver for use with the RMP60 radio probe.

It is designed to be easily mounted within, or close to, the machine, resulting in a quick and simple installation.

The RMP60 RMI system is ideal for retrofitting to existing machines.

A visual indication of system status is provided by LEDs. Status is continuously updated and indication is provided for start, low battery, probe status, error and signal strength.



All dimensions are in mm (in).



17.5 (0.69)

| | RMI |
|------------------------------|--|
| PRINCIPAL APPLICATION | Workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes |
| TRANSMISSION TYPE | Frequency hopping spread spectrum radio (FHSS) |
| CABLE | Ø7.5 mm (0.29 in), 13-core screened cable, each core 18 x 0.1 mm. The RMI is supplied with a 15 m cable assembly as standard. 30 m and 50 m cable assemblies are also available. |
| MOUNTING | An optional mounting bracket is available, allowing directional setting. The RMI cable can be reconfigured for rear exit. |
| SEALING | IPX8 |
| COMPATIBLE INTERFACE | The RMI does not require an additional interface |
| SUITABLE PROBES [†] | RMP60 radio transmission probe |
| | |

† See relevant application sections for more details.

IMM

The IMM is an inductive module that may be attached to the spindle nose of a CNC machining centre. The preferred configuration has a rear exit cable.

An alternative configuration uses a side exit cable which can be supplied with various conduits to suit the application.

The IMM may also be fitted to the main casting at the rear of a tool turret on a CNC lathe. In this instance, the unit is cylindrical with a rear exit cable.

Inductive transmission is not recommended for retrofit installations. Machine builders should contact their Renishaw supplier for further details.

The IMM is also available with a ceramic face for applications where swarf may cause erosion to the standard face.





Ø20

(0.78)







All dimensions are in mm (in).

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| | ІММ |
|-----------------------------------|---|
| PRINCIPAL APPLICATION | Machining centres and lathes |
| TRANSMISSION TYPE | Electromagnetic induction |
| INDUCTIVE MODULE AIR GAP | 0.1 mm (0.004 in) to 2.1 mm (0.08 in) |
| INDUCTIVE MODULE ECCENTRICITY | 2.0 mm (0.08) max |
| CABLE Standard Extension | Screened, 3-core, 7/0.2 Ø4.3 mm (Ø0.17 in) x 5 m (16.4 ft) long Various 5.5 m (18.0 ft) to 25.5 m (83.6 ft) Max length permitted = 100 m (328 ft) Exposed cables must be located in protective conduit |
| CONDUIT (Side exit units only) | Ø11 mm (Ø0.43 in) flexible conduit Ø8 mm (Ø0.31 in) steel conduit |
| SEALING | IPX8 |
| COMPATIBLE INTERFACE [¥] | MI5 |
| SUITABLE PROBES [†] | MP1 or MP3 for machining centre applications LP2 for lathe applications |

¥ See INTERFACES section for more details.

† See relevant application sections for more details.

OMP40 transmission range

The diodes of the OMP40 probe and OMI or OMM must be in each other's field of view and within the performance envelope shown. The OMP40 performance envelope is based on the OMI or OMM being at 0° and vice-versa. Natural reflective surfaces in the machine may increase the signal transmission range.

360° transmission around the probe axis in metres (feet)









OMP60 transmission range with OMI-2 (modulated transmission)

The diodes of the OMP60 probe and OMI-2 must be in each other's field of view and within the performance envelope shown. The OMP60 performance envelope is based on the OMI-2 being at 0° and vice-versa.

360° transmission around the probe axis in metres (feet).

Switch on/off Operating



Coptical transmission berformance

OMP60 with OMI-2 (modulated transmission)



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OMP60 transmission ranges with OMI (legacy transmission)

The diodes of the OMP60 probe and OMI must be in each other's field of view and within the performance envelope shown. The OMP60 performance envelope is based on the OMI being at 0° and vice-versa.

360° transmission around the probe axis in metres (feet).

Switch on/off Operating



OMP60 with OMI (legacy transmission)





OMP60 transmission ranges with OMM/MI 12 (legacy transmission)

The diodes of the OMP60 probe and OMM must be in each other's field of view and within the performance envelope shown. The OMP60 performance envelope is based on the OMM being at 0° and vice-versa.

360° transmission around the probe axis in metres (feet).

Switch on/off Operating



OMP60 with OMM (legacy transmission)



operating range with OMP60 low optical power.

MP10/MP700 transmission range with OMI

The diodes of the MP10/MP700 probe and the OMI must be in each other's field of view and within the performance envelope shown. Natural reflective surfaces in the machine may increase the signal transmission range.

The MP10 and MP700 both have 360° optical transmission and "switch on". The optical range values quoted below apply for any spindle orientation.

The OMI has a slightly different optical range than OMM, offering a wider field of view but a shorter transmit/receive range. This makes it ideal for small machine installations.









Transmission angles

Optical centre line

35

70

MP10/MP700 transmission range with OMM

The diodes of the MP10/MP700 probe and the OMM must be in each other's field of view and within the performance envelope shown. Natural reflective surfaces in the machine may increase the signal transmission range.

The MP10 and MP700 both have 360° optical transmission and "switch on". The optical range values quoted below apply for any spindle orientation.

Two OMMs can be fitted on a single machine where sufficient coverage cannot be provided by a single receiver.



MP10E/MP700E transmission range with OMME

The MP10E/MP700E has a 360° transmission envelope over the ranges shown below. Two OMMEs can be fitted on a single machine where sufficient coverage cannot be provided by a single receiver.

The probe system should be positioned such that the optimum range can be achieved over the full travel of the machine's axis.

The probe and OMME may deviate from the optical centre line, provided opposing light cones always overlap with transmitters and receivers in each other's field of view.

Absolute minimum (no reflection) plot shown.







MP12 transmission range

The MP12 features a uni-directional optical transmission system. This requires the machine's spindle to be orientated so the probe window is facing the receiver. The data given below assumes that the probe and receiver (OMM or OMI) are aligned.









LTO2/LTO2T/LTO3T/LTO2S transmission range

The LTO2 range is designed for lathe applications and uses a uni-directional optical transmission system

This requires the transmitter and receiver (OMM or OMI) to be approximately aligned when the probe is to be operated. The data given below assumes that the transmitter and receiver are aligned.

All distances are in metres (feet).

Switch on/off Operating

LTO2 family typical operating envelope with OMI





LTO2 family typical operating envelope with OMM



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RMP60 transmission range with RMI

The RMP60 and RMI must be within each other's operating envelope. The operating envelope shows line-of-sight performance; however radio transmission does not require line-of-sight as long as any reflected signal path is less than the 15 m (49.2 ft) system operating range.

All distances are in metres (feet).

Operating and switch on/off

Transmission angles



RMP60 operating envelope with RMI





CNC machining centre and milling machine inspection probing systems

Applications

Renishaw probes can be used on machining centres and milling machines for component setting and inspection applications.



Component setting

The probe identifies the position of the workpiece, automatically updating work offsets, and enabling parts to be made right first time.

This can also be used for:

- part identification for FMS installations.
- · component location and also misload detection to avoid scrap.
- excess material identification to bring the cutter to the component quickly and safely.

First-off inspection

Inspection of the first component in a batch on the machine tool to:

- reduce the time the machine is idle awaiting feedback from an off-line inspection device.
- correct any errors automatically.

In-process inspection

Measure components following rough machining to:

- · ensure critical final cuts are correct.
- highlight errors before they become faults.

The frequency of inspection will depend on the value of the component and confidence in the machine's performance. Inspection of key features on high value components is usually essential for unmanned machining operations.

Post process inspection

Inspection of the part once the machining is completed can be used to:

- provide information to certify that the component is within its specification.
- · record part dimensions for statistical process control.

Probe selection

On machining centres, probes require a remote transmission system (see section 2, Transmission selection).

The following pages show some of the most common types of inspection probe applications on machining centres:

- 1. The **OMP40** has been designed specifically to meet the demands for small machining centres and the growing family of high-speed machines fitted with small HSK and small taper spindles.
- A small, vertical machining centre fitted with an MP12 compact inspection probe using optical transmission.
- A horizontal machining centre fitted with an OMP60 probe featuring 360° optical transmission. The OMP60 is also suitable for larger vertical machines.
- The RMP60 probe has been designed for use on all medium to large machines, particularly when non line-ofsight is required.

Other common applications include:

- Where high precision is required, Renishaw's **MP700** 'strain gauge' probe is recommended. Using optical transmission, the MP700 is ideal for inspection of contoured components and components requiring long styli reach.
- On milling machines, simple hard-wired probes and 'job contact' probes are available.
- The MP10E / MP700E systems have been specifically designed for 5-axis and large machining centres.

| Machine | Small | Medium | Large | | |
|-----------------------|-------------------|------------------|-------------|--|--|
| CNC machining centres | | | | | |
| Vertical | OMP40/MP12 | RMP60/OMP60/MP10 | RMP60/MP10E | | |
| Horizontal | OMP40/OMP60/MP10 | RMP60/OMP60/MP10 | RMP60/MP10E | | |
| High accuracy | MP700 | MP700 | MP700E | | |
| Milling machines | | | | | |
| CNC machines | MP15 | MP11 | MP11 | | |
| Manual machines | Job contact probe | | | | |

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1. The OMP40 has been designed specifically to meet the demands for small machining centres and the growing family of high-speed machines fitted with small HSK and small taper spindles.



2. A **small vertical machining centre** fitted with an MP12 probe using optical transmission. In this installation the probe is coupled with an OMI with integral interface.



3. A **horizontal machining centre** fitted with an OMP60 probe using 360° optical transmission. An OMM with separate MI12 interface is used in this installation.



4. A **large machine** fitted with an RMP60 RMI system, designed for use on all medium to large machines, particularly when non-line-of-sight is required.











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OMP40

The OMP40 has been designed specifically to meet the demands for small machining centres and the growing family of high-speed machines fitted with small HSK and small taper spindles.

OMP40 features and benefits:

- Miniaturisation of electronics without compromising performance
- Simplified installation ideal for retrofit
- Long battery life, minimal downtime, industry-leading economy
- · Shock and vibration resistant



All dimensions are in mm (in).

| | OMP40 | | | |
|--|--|--|---|-------------------------|
| PRINCIPAL APPLICATION | Small machining o | Small machining centres and drill / tap machines | | |
| TRANSMISSION TYPE [†] MAXIMUM RANGE | 360° infrared optic 3 m (9.84 ft) | 360° infrared optical transmission 3 m (9.84 ft) | | |
| TURN ON/OFF METHOD | Optical on/optical | Optical on/optical off or optical on/time out | | |
| SENSE DIRECTIONS | Omni-directional ± | X ±Y +Z | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 µm (0.00004 ir | 1.0 μm (0.00004 in) | | |
| WEIGHT | 262 g (9.2 oz) | | | |
| TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force Z direction | Not adjustable 0.5 N (50 gf) 1.76 0.9 N (90 gf) 3.17 5.85 N (585 gf) 20 | ozf ozf .6 ozf | | |
| STYLUS OVERTRAVEL XY plane Z direction | ±11° 6 mm (0.23 in) | | | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 50 mm (1.97 in) 100 mm (3.94 in) | | | |
| BATTERY TYPE AND LIFE Standard Stand-by 5% usage Continuous life | 2 × Lithium 1/2 AA (Low 1900 days (1900 100 days (150 120 hours (180 | A power mode)) days) days) hours) | | |
| SEALING | IPX8 | | | |
| SHANKS [§] | Various | | | |
| COMPATIBLE INTERFACE [¥] | OMI or OMM/MI12 | 2 | | |
| See TRANSMISSION SYSTEMS section for more details. § See SHANKS section for more details. ¥ See INTERFACES section for more details. | ‡ Test conditions: | stylus length: stylus velocity: stylus force: | 50 mm 480 mm/min factory settings | 1.97 in 18.90 in/min |

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OMP60

The OMP60 is an optical machining probe suitable for medium to large machining and mill-turn centres.

When the OMP60 is combined with the OMI-2, the system utilises a modulated optical transmission method to provide the highest level of resistance to light interference.

Being compatible with existing OMM/MI 12 and OMI receivers, the OMP60 can also be operated using the existing 'legacy' optical transmission method. This enables current MP7, MP8, MP9 and MP10 system users to benefit from its innovative features.

OMP60 features and benefits:

- · Compact probe, measuring Ø63 mm × 76 mm long
- · 360° infra-red transmission with 6 m typical operating range
- · Rejection of optical interference when used with OMI-2
- · Simple installation and configuration
- · Multiple switch-on/switch-off methods
- · Backward compatible with existing Renishaw receivers

OMDEO

· Uses AA batteries that are readily available



All dimensions are in mm (in).

| PRINCIPAL APPLICATION | Workpiece measurement and jo centres and mill-turn centres | b set-up on small to medium sized machining |
|--|--|--|
| TRANSMISSION TYPE [†] | 360° infra-red optical transmissi | on |
| OPERATING RANGE | Up to 6 m (19.7 ft) | |
| TURN ON METHOD TURN OFF METHOD | Optical 'M' code, spin, shank sw Optical 'M' code, time out, spin, | ritch shank switch |
| SENSE DIRECTIONS | Omni-directional ±X, ±Y, +Z | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | |
| WEIGHT (without shank) With batteries: Without batteries: | 878 g (30.79 oz) 834 g (29.42 oz) | |
| TRIGGER FORCE (XY plane factory se XY plane – lowest force XY plane – highest force Z direction | tting) 0.75 N (75 gf) 2.64 ozf 1.4 N (140 gf) 4.92 ozf 5.3 N (530 gf) 18.69 ozf | |
| MAXIMUM ACCELERATION | 150 m/s ² | |
| STYLUS OVERTRAVEL XY plane Z direction | ±18° 11 mm (0.43 in) | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 50 mm (1.97 in) 100 mm (3.94 in) | |
| BATTERY TYPE AND LIFE Standby 5% usage Continuous life | 2 × AA 1.5 V alkaline 468 days max. 111 days max. 172 hours max | 2 × AA 3.6 V lithium thionyl chloride (alternative) 1019 days max. 339 days max. 595 hours max. |
| SEALING | IPX8 | |
| SHANKS [§] | Various | |
| | OMM/MI 12, OMI or OMI-2 | |
| + See TRANSMISSION SYSTEMS section for | r more details. ‡ Test conditions: | stylus length: 50 mm 1.97 in |

§ See SHANKS section for more details.

¥ See INTERFACES section for more details.

stylus velocity:

RMP60 radio transmission probe

The RMP60 inspection probe is the first to use frequency hopping spread spectrum (FHSS) transmission and offers rapid part set-up and part verification on machining centres of all sizes. It is paired with the RMI, a combined transmitter and receiver unit.

The RMP60's unique transmission system does not have a dedicated radio channel. Instead, the probe and receiver "hop" together through a sequence of frequencies.

RMP60 features and benefits:

· Compact probe measuring just Ø63 mm x 76 mm in length

DMD60

- Stainless steel body to withstand harsh machine tool environments
- · No channel selection requirements
- Operating range of up to 15 m (49.21 ft)



All dimensions are in mm (in).

| | niviF00 | | |
|---|--|--|--|
| PRINCIPAL APPLICATION | Workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turre lathes. | | |
| TERRITORY | EU, USA, Japan, Canada, Switzerland, Australia, New Zealand, Russia, Israel and China. | | |
| TRANSMISSION TYPE [†] | Frequency hopping spread | spectrum radio (FHSS) | |
| OPERATING RANGE | Up to 15 m (49.21 ft) | | |
| NOMINAL FREQUENCY | 2.402 – 2.481 GHz | | |
| TURN ON METHOD TURN OFF METHOD | Radio 'M' code, spin, shank Radio 'M' code, time out, sp | k switch pin, shank switch | |
| SENSE DIRECTIONS | Omni-directional: ±X, ±Y, + | Z | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | |
| WEIGHT | 901 g (32 oz) | | |
| TRIGGER FORCE XY plane – lowest force XY plane – highest force +Z axis | 0.75 N (75 gf) 2.64 ozf 1.40 N (140 gf) 4.92 ozf 5.30 N (530 gf) 18.69 ozf | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±18° 11 mm (0.43 in) | | |
| MAX SPIN SPEED | 1000 rev/min | | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 50 mm (1.97 in) 100 mm (3.94 in) | | |
| BATTERY TYPE AND LIFE Stand by 5 % usage Continuous life | 2 × AA 1.5 V alkaline 650 days max. 100 days max. 140 hours max. | 2 × AA 3.6 V lithium thionyl chloride (alternative) 1300 days max. 200 days max. 280 hours max. | |
| SEALING | IPX8 | | |
| SHANKS [§] | Various | | |
| COMPATIBLE INTERFACE [¥] | RMI | | |
| | | | |

† See TRANSMISSION SYSTEMS section for more details.

§ See SHANKS section for more details.

¥ See INTERFACES section for more details

‡ Test conditions stylus length: stylus velocity: stylus force:

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MP10/MP10E

The MP10 is a robust inspection probe for workpiece set-up and workpiece inspection on small to medium sized CNC machining centres.

The MP10E has been designed for use on large and 5-axis machines and is available with a high powered optical transmission range up to 9.5 m.

MP10 features and benefits:

- · Ideal for a wide range of machining centres
- + Available with either 35° or 70° output and features wide beam transmission – up to 130°
- · Continuous battery life of up to 140 hours
- Full 360° signal transmission and up to 6 m (19.6 ft) range.
- · Adjustable trigger force



Machining centre inspection 3.6

All dimensions are in mm (in).

| | MP10 / MP10E | | | | |
|--|--|------------------------------------|---------------------|-------------------------|--|
| PRINCIPAL APPLICATION | Vertical and horizontal machining centres | | | | |
| TRANSMISSION TYPE [†] MAXIMUM RANGE | 360° infrared optical transmission35° and 70° angles (MP10E - 70° only)MP10 OMI3 metres (9.84 ft)MP10 OMM/MI126 metres (19.69 ft)MP10E OMME/MI12E9.5 metres (31.17 ft) | | | | |
| TURN ON/OFF METHOD | Optical on/optical off or opt | ical on/time out | | | |
| SENSE DIRECTIONS | Omni-directional: ±X, ±Y, + | Z | | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | | | |
| WEIGHT | 730 g (26 oz) | | | | |
| TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force +Z direction | Adjustable 0.75 N (75 gf) 2.64 ozf 1.40 N (140 gf) 4.92 ozf 4.20 N (420 gf) 14.8 ozf | | | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±17.5° 8 mm (0.31 in) | | | | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 50 mm (1.97 in) 100 mm (3.94 in) | | | | |
| BATTERY TYPE AND LIFE Stand-by 5% usage Continuous life | 1 × 6LR61 (PP3 9 V alkalin 365 days 98 days 140 hours | ne) | | | |
| SEALING | IPX8 | | | | |
| SHANKS [§] | Various | | | | |
| COMPATIBLE INTERFACE [¥] | OMI or OMM/MI12 (MP10E – OMME / MI12E) | | | | |
| See TRANSMISSION SYSTEMS section for m See SHANKS section for more details. | ore details. | stylus length: stylus velocity: | 50 mm 480 mm/min | 1.97 in 18.90 in/min | |

§ See SHANKS section for more details

¥ See INTERFACES section for more details.

stylus velocity: stylus force:

80 mm/min factory settings

MP12

The MP12 is a compact 3D touch-trigger inspection probe, designed for workpiece set-up and inspection on small to medium sized CNC machining centres.

MP12 features and benefits:

- · Typical battery life of 205 days at 5% usage
- · Ideal for use on small to medium machining centres
- · Stylus on-centre adjustment
- . Sealed to IPX8 for reliable operation in the machine tool environment



PRINCIPAL APPLICATION Small vertical machining centres TRANSMISSION TYPE[†] Uni-directional infrared optical transmission MP12 OMI 3 metres (9.84 ft) MP12 OMM / MI12 3 metres (9.84 ft) TURN ON/OFF METHOD Optical on/optical off or optical on/time out SENSE DIRECTIONS Omni-directional: ±X, ±Y, +Z UNI-DIRECTIONAL REPEATABILITY 1.0 µm (0.00004 in) MAX (2σ) AT STYLUS TIP[‡] WEIGHT 420 g (15 oz) TRIGGER FORCE (factory setting) Not adjustable XY plane - lowest force 0.65 N (65 gf) 2.29 ozf XY plane - highest force 1.60 N (160 gf) 5.64 ozf +Z direction 8.00 N (800 gf) 28.22 ozf STYLUS OVERTRAVEL XY plane ±15° +Z direction 11 mm (0.43 in) STANDARD STYLUS LENGTH 50 mm (1.97 in) MAXIMUM STYLUS LENGTH 100 mm (3.94 in) BATTERY TYPE AND LIFE 4 × LR6 (AA 1.5 V alkaline) Stand-by 471 days 205 days 5% usage Continuous life 425 hours SEALING IPX8 **SHANKS**§ Various COMPATIBLE INTERFACE[¥] OMI or OMM/MI12 † See TRANSMISSION SYSTEMS section for more details. ‡ Test conditions: stylus length: 50 mm 1.97 in § See SHANKS section for more details. 480 mm/min 18.90 in/min

MP12

¥ See INTERFACES section for more details

stylus velocity: stylus force:

factory setting

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MP700 / MP700E

The MP700 high-accuracy probe uses solid-state strain gauge technology to sense contact between the stylus and the surface of a workpiece.

The MP700 allows probing with a low constant trigger force in any direction, after simple probe calibration.

MP700 features and benefits:

- Superior 3D measurement performance probe repeatability of 0.25 μm (2σ)
- · Provides improved accuracy even with long styli
- Significantly longer life due to proven solid-state technology
- Designed for use on large and 5-axis machines
- High resistance to shock and vibration



All dimensions are in mm (in).

| PRINCIPAL APPLICATION | High accuracy inspection on vertical and horizontal machining centres | | |
|---|--|--|--|
| TRANSMISSION TYPE [†] MAXIMUM RANGE | 360° infrared optical trar MP700 OMI MP700 OMM/MI12 MP700E OMME/MI12E | nsmission 35° and 70° angles (MP700E 70° only) 3 metres (9.84 ft) 6 metres (19.69 ft) 9.5 metres (31.17 ft) | |
| TURN ON/OFF METHOD | Optical on/optical off or | optical on/time out | |
| SENSE DIRECTIONS | Omni-directional: ±X, ±Y, +Z | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 0.25 µm (0.00001 in) | | |
| PRE-TRAVEL VARIATION [‡] XY plane XYZ (variation from a true sphere) | ±0.25 μm (±0.00001 in) ±1.0 μm (±0.00004 in) | | |
| WEIGHT | 700 g (25 oz) | | |
| TRIGGER FORCE (factory setting) XY plane – constant force +Z direction | Not adjustable 0.02 N (2 gf) 0.07 ozf 0.15 N (15 gf) 0.53 ozf | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±16.5° 11 mm (0.43 in) | | |
| STANDARD STYLUS LENGTH* MAXIMUM STYLUS LENGTH* | 100 mm (3.94 in) 200 mm (7.87 in) | | |
| BATTERY TYPE AND LIFE Stand-by 5% usage Continuous life | 1 × 6LR61 (PP3 9 V alk 381 days 36 days 43 hours | aline) | |
| SEALING | IPX8 | | |
| SHANKS [§] | Various | | |
| COMPATIBLE INTERFACE [¥] | OMM/MI12 or OMI (MP7 | 700E – OMME / MI12E) | |
| | | | |

MP700 / MP700E

† See TRANSMISSION SYSTEMS section for more details.M4 carbon fibre styli are recommended. See STYLI section.

nditions: stylus length: 5 stylus velocity: 2

stylus force:

50 mm 1.97 in 240 mm/min 9.45 in/min factory settings

§ See SHANKS section for more details.¥ See INTERFACES section for more details.

MP3 inductive

Supplied with an inductive transmission system, the MP3 inductive probe system has been designed for fitting by machine builders.

Battery-free, the probe offers generous overtravel for robust operation.

A range of IMP arms (defined by 'L' and 'R' dimensions) is available to suit different machine installations.

Inductive transmission is not recommended for retrofit installations. Machine builders should contact their Renishaw supplier for further details.



All dimensions are in mm (in).

| | MP3 inductive | | |
|--|---|--|--|
| PRINCIPAL APPLICATION | Vertical and horizontal machining centres | | |
| TRANSMISSION TYPE [†] | Electromagnetic induction | | |
| PROBING DIRECTIONS | Omni-directional: ±X, ±Y, +Z | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | |
| WEIGHT | Varies depending on IMP arm dimensions | | |
| TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force +Z direction | Adjustable 0.75 N (75 gf) 2.6 ozf 1.50 N (150 gf) 5.2 ozf 4.90 N (490 gf) 17.3 ozf | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±28.5° 17 mm (0.67 in) | | |
| DIMENSION 'L' | 5 mm (0.20 in) to 60 mm (2.36 in) | | |
| DIMENSION 'R' | 55 mm (2.16 in) to 115 mm (4.52 in) | | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 100 mm (3.94 in) 150 mm (5.91 in) | | |
| SEALING | IPX8 | | |
| SHANKS§ | Various | | |
| COMPATIBLE INTERFACE [¥] | IMM/MI5 | | |
| † See TRANSMISSION SYSTEMS section for m | ore details. | | |

§ See SHANKS section for more details.

¥ See INTERFACES section for more details.

480 mm/min 18.90 in/min factory settings



Machining centre

inspection

3.10

MP11

Designed for CNC milling machines, with manual tool change, the MP11 can be inserted manually into the machine's spindle.

The MP11 features an integral interface which processes signals between the probe and the CNC machine's control. Signals are transmitted through the curly cable, which connects to the probe via a plug.



stylus force:

factory settings

All dimensions are in mm (in).

| PRINCIPAL APPLICATION | CNC mill | CNC milling machines | | | |
|--|--|--|------------------|-------------|----------------|
| TRANSMISSION TYPE [†] | Hard-wir | Hard-wired | | | |
| SENSE DIRECTIONS | Omni-dir | Omni-directional: ±X, ±Y, +Z | | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 µm ((| 1.0 μm (0.00004 in) | | | |
| WEIGHT | 540 g (19 | 540 g (19 oz) | | | |
| TRIGGER FORCE (factory setting) XY plane – lowest force XY plane – highest force +Z direction | Adjustab 0.5 N (50 1.5 N (15 1.8 N to | Adjustable 0.5 N (50 gf) 1.76 ozf 1.5 N (150 gf) 5.29 ozf 1.8 N to 7.0 N (180 gf to 700 gf) 6.35 ozf to 24.69 ozf | | | |
| STYLUS OVERTRAVEL | | | | | |
| XY plane | ±17.5° | | | | |
| +Z direction | 8 mm (0. | 8 mm (0.31 in) | | | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 50 mm (⁻ 100 mm | 1.97 in) (3.94 in) | | | |
| SEALING | IP 66 | IP 66 | | | |
| SHANKS§ | Various | | | | |
| COMPATIBLE INTERFACE [¥] | Integral i | nterface | | | |
| † See TRANSMISSION SYSTEMS section for m | ore details. | ‡ Test conditions: | stylus length: | 50 mm | 1.97 in |
| § See SHANKS section for more details. | | | stylus velocity: | 1000 mm/min | 39.37 in / min |

MP11

¥ See INTERFACES section for more details.

Job contact probes

Job contact probes have been designed for use on manual machines and are ideal for workpiece set-up and simple inspection.

The JCP1, available with metric and imperial shanks, uses electrical conductivity to sense contact with a metallic workpiece. An LED is illuminated when the stylus touches the surface.

The JC30C variant provides a cable connection to digital readout counters with touch sensor inputs.



All dimensions are in mm (in).

| PRINCIPAL APPLICATION | Manual milling machines | | | |
|--|---|-------------------------------|-------------------------|--|
| TRANSMISSION TYPE | None or hard-wired to touch sensor inputs | | | |
| SENSE DIRECTIONS | Omni-directional: ±X, ±Y, +Z | | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | | |
| WEIGHT | 240 g (8.5 oz) | | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±15 mm (±0.59 in) 5 mm (0.20 in) | | | |
| STYLUS DIMENSIONS Fixed length Diameter | JC30C / JCP1-M: 42.75 mm 6 mm | JCP1-I: 1.68 in 0.24 in | | |
| BATTERY TYPE AND LIFE Continuous life | 2 × LR1 1.5 V 30 hours | | | |
| SEALING | IP 44 | | | |
| SHANKS | JC30C Ø16 mm JCP1-M Ø20 mm | JCP1-I Ø0.75 | in | |
| COMPATIBLE INTERFACE | None required: JC30C version touch sensor input | wires directly int | o a digital readout | |
| | ‡ Test conditions: stylus length: stylus velocity: | 50 mm 480 mm/min | 1.97 in 18.90 in/min | |

stylus velocity: 48 stylus force: fa

480 mm/min 18.90 in/min factory settings

JC30C / JCP1-M / JCP1-I

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CNC machining centre tool setting and breakage detection probing systems

Applications

Renishaw probes can be used on machining centres for tool setting, tool verification and tool breakage detection applications.



TS27R contact tool setter

Tool setting

Tools are driven against the probe's stylus with the tool either static or rotating:

- · Static length setting for drills, taps etc.
- Rotating length setting for face mills and other large cutters.
- Rotating diameter setting for slot drills, boring bars etc.

Tool verification

Tool lengths and diameters can be checked before use to guard against errors in tool selection.

Tool breakage detection

Rapid checking of tool lengths to ensure that tools are still intact after machining.

Probe selection

On a typical machining centre, a tool setting probe can be located on the bed of the machine.

However, more complex machines may require an arm to introduce the probe to the tools.

The following page shows some of the most common tool setting probe applications on machining centres.

- A typical vertical machining centre fitted with a TS27R compact tool setting probe. This simple probing system uses a hardwired transmission.
- A typical vertical machining centre fitted with a fixed NC4 non-contact tool setting system. This system includes an adjuster pack for simple alignment to the machine's axes. Also available is the NC3 – a compact non-contact tool setter and broken tool detection system – and the NC2, which provides broken tool detection.
- A HPMA automatic tool setting arm fitted to a horizontal machining centre with a multipallet changer. This solution is ideal for FMS applications. For details about HPMA refer to the CNC lathe tool setting probing systems section.

In addition to rotary arms like the HPMA, Renishaw can also provide a range of customised tool setting solutions. Refer to the Custom Products and Accessories section for more details.

| Application | Probing system |
|---|-------------------------------|
| Vertical or horizontal machine with fixed bed | TS27R TRS1/NC2/NC3/ NC4 |
| Horizontal machine with multi-pallet changer | HPMA/TRS1/ NC4 |

1. A **vertical machining centre** fitted with a TS27R tool setting probe. The TS27R is also available with styli to suit horizontal machining centre applications.



2. A **vertical machining centre** fitted with a fixed NC4 non-contact tool setting system, using laser-based transmitter and receiver units. NC4 is also available as a separate system.





3. A typical **FMS machine** fitted with a HPMA automatic tool setting. The HPMA provides an automated system with which the tool setting probe can be introduced to the tools exactly when required.







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TRS1 Single-sided tool breakage detection

Conventional non-contact broken tool detection systems depend on the laser beam being blocked (tool OK) or not blocked (tool broken).

The TRS1 is different. It contains unique tool recognition technology that can distinguish between the tool or coolant and swarf. TRS1 responds to the pattern of light reflected from the tool, offering benefits over conventional systems. It is fast and reliable under real machining conditions.

The single unit means installation is quick and easy and the device can be mounted outside of the working environment, saving valuable space on the table.

TRS1 features and benefits:

- · Cost effective, fast and reliable
- Features new tool recognition technology
- Ultra-quick detection. Tool spends approximately 1 second in the laser beam
- Simple installation and set up



| PRINCIPAL APPLICATION | High-speed non-contact tool breakage detection on VMC and HMC machines |
|-----------------------|---|
| LASER TYPE | Visible red light <1 mW 670 nm. Conforms to American (21 CRF 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001) and European (IEC 60825-1:1993 + A1: 1997 + A2: 2001) laser safety standards |
| WORKING TEMPERATURE | 5 °C to 50 °C |
| STORAGE TEMPERATURE | -10 °C to 70 °C |
| LIFE | Tested to > 1 million on/off cycles. |
| MINIMUM TOOL DIAMETER | Ø1 mm bright drill at 2 m (6.56 ft) and Ø0.5 mm bright drill at 0.3 m (0.984 ft), dependent on installation, set-up and tool type/condition. |
| PNEUMATIC SUPPLY | Ø4 mm air pipe. Recommended air pressure: 2 bar (29 psi) to 4.5 bar (65.25 psi), dependent on air pipe length. Air supply to the TRS1 air regulator unit must conform to ISO 8573-1: Class 5 particles and moisture-free. Air supply to the TRS1 unit must conform to ISO 8573-1: Air quality of class 1.7.2. |
| WEIGHT | 0.75 kg (1.65 lb), including 10 m of cable. |
| DIMENSIONS | Height: 83 mm (3.27 in) Width: 38 mm (1.50 in) Depth: 73 mm (2.87 in) |
| INPUT VOLTAGE | Input voltage 11 Vdc to 30 Vdc. |
| CURRENT CONSUMPTION | Typically less than 45 mA. |
| CABLE | 5-core plus screen cable. Each core 18/0.1 insulated. Ø5.0 mm (0.20 in) x 10 m (32 ft) |
| OUTPUT | Solid state relay (SSR) normally-open/normally-closed contact max. 40 mA (fused at 50 mA). |
| SEALING | Sealed to IPX8 with air on |
| MOUNTING | Mounting bracket provided with M4 mounting holes. Alternative mounting arrangement provided by M4 holes in the product housing. |
| | |

NC4

Non-contact tool setting and tool breakage detection device

The NC4 is a flexible laser system, with ultra-compact laser tool setting transmitter and receiver units that can be mounted onto separate brackets, or as a single fixed unit. The NC4 allows fast, non-contact tool setting and tool breakage detection on machines previously unsuitable for such applications.

NC4 features and benefits:

- Compact units measuring just Ø30 mm (1.18 in) and 35 mm (1.38 in) in height
- Separate systems available up to 5 metres
- New PassiveSeal[™] protection device
- · Simplified set-up and installation

All dimensions are in mm (in).



For guidance purposes only

| Tx / Rx separation (m) | | Minimum tool diameter (mm) when | | |
|------------------------|-------|------------------------------------|----------|--|
| | | | detected | |
| Compact | 0.023 | 0.03 | 0.03 | |
| fixed | 0.055 | 0.07 | 0.04 | |
| system | 0.170 | 0.20 | 0.07 | |
| Modular fixed system | 0.225 | 0.20 | 0.10 | |
| | 0.50 | 0.30 | 0.10 | |
| | 1.00 | 0.40 | 0.20 | |
| Separate system | 2.00 | 0.50 | 0.20 | |
| | 3.00 | 0.60 | 0.30 | |
| | 4.00 | 1.00 | 0.30 | |
| | 5.00 | 1.00 | 0.30 | |

Compact fixed system - F115 and F230 models



| Model | Dimension A | Dimension B | Dimension C |
|----------|-------------|-------------|-------------|
| NC4 F115 | 55 | 115 | 57,5 |
| NC4 F230 | 170 | 230 | 115 |

Compact fixed system - F95 model



Modular fixed system





70 (2.76)

NC4 Non-contact tool setting and tool breakage detection device

| | FIXED | SEPARATE | |
|---|--|--|--|
| PRINCIPAL APPLICATION | High precision, high speed, non-contact tool measurement and broken tool detection on vertical and horizontal machining centres | | |
| LASER TYPE | Visible red light <1 mW 670 nm. Conforms 1040.11 except for deviations pursuant to 2001) and European (IEC 60852-1:1993 + standards | to American (21 CRF 1040.10 and Laser Notice No. 50 dated July 26, A1: 1997 + A2: 2001) laser safety | |
| LASER BEAM ALIGNMENT | Adjuster pack | Optional mounting brackets available | |
| ELECTRICAL CONNECTION ARRANGEMENT | Hard-wired cable on end of unit. Other options available on request | Hard-wired cable on underside of unit | |
| REPEATABILITY OF TRIGGER POINTS | \pm 1.0 μm (2 σ) at 1 m separation (see the g | raph on the previous page) | |
| MINIMUM TOOL DIAMETER FOR MEASUREMENT | 0.03 mm (0.001 in) or larger, depending on separation and set-up | See the table on the previous page | |
| MINIMUM TOOL DIAMETER FOR BREAKAGE DETECTION | 0.03 mm (0.001 in) or larger (see the table on the previous page) | See the table on the previous page | |
| AIR PROTECTION SYSTEM | Supply pressure greater than 3 bar, air usage 8 litres / min. Supply to the unit must conform to ISO 8573-1 : Air quality class 5.7. | | |
| POWER SUPPLY | 120 mA @ 12 V, 70 mA @ 24 V | | |
| OUTPUT SIGNAL WITH NCi-4 | Voltage-free SSR | Voltage-free SSR | |
| TEMPERATURE LIMIT | Operating +5 °C to +50 °C. Storage -10 °C | C to +70 °C | |
| DIMENSIONS | See the previous page | 30 mm (1.18 in) diameter × 35 mm (1.38 in) long | |
| SEPARATIONS AVAILABLE | 300 mm system, providing a 225 mm operating gap. 230 mm (170 mm) 115 mm (55 mm) 95 mm (23 mm) | 0.5 m to 0.8 m 0.8 m to 1.5 m 1.5 m to 2 m 2 m to 3 m 3 m to 5 m Other options available on request | |
| SEALING | IPX8 with or without air | IPX8 with or without air | |
| MOUNTING | Single M10 or M12 fixing Alternative fixing arrangement available | Fixing for M3 screws | |
| COMPATIBLE INTERFACE [¥] | NCi-4 | NCi-4 | |
| | | | |

¥ See INTERFACES section for more details.

NC3 compact laser system

The NC3 is a compact 2-axis non-contact tool setting system, with broken tool detection capability.

Tools as small as 0.2 mm diameter can be measured anywhere along the laser beam.

Set-up is simpler than focused laser systems as there is no focal point to identify.

It is hard-wired to the NCi-4 interface unit, which features a unique 'drip rejection mode'. This 'drip rejection' feature offers protection against unwanted trigger signals.

The NC3 offers improved repeatability, reduction in air consumption and an improved rapid tool-breakage detection cycle and with faster operation, gives greater repeatability.

NC3 features and benefits:

- Impressive repeatability of $\pm 0.15~\mu m$ (2 σ)
- · High speed broken tool detection cycle
- Measure tools of Ø0.2 mm and larger.
- Detect broken tools as small as $\ensuremath{\textit{\emptyset}0.1}\xspace$ mm



All dimensions are in mm (in).

| | NC3 |
|---|--|
| PRINCIPAL APPLICATION | High-precision/high-speed, non-contact tool setting and tool breakage detection |
| LASER TYPE | Visible red light <1 mW 670 nm. Conforms to American (21 CRF 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001) and European (IEC 60852-1:1993 + A1: 1997 + A2: 2001) laser safety standards |
| LASER BEAM ALIGNMENT | Adjuster pack – supplied. Options available. |
| ELECTRICAL CONNECTION ARRANGEMENT | Hard-wired |
| REPEATABILITY OF TRIGGER POINTS | ± 0.15 μm (6 μin) 2σ |
| MINIMUM TOOL DIAMETER FOR MEASUREMENT | Ø0.2 mm (0.008 in) |
| MINIMUM TOOL DIAMETER FOR BREAKAGE DETECTION | Ø0.1 mm (0.004 in) or larger |
| AIR PROTECTION SYSTEM | Supply pressure greater than 3 bar, air usage 6 litres / min. Supply must conform to ISO 8573-1 : Air quality class 5.7. Nylon piping included. |
| POWER SUPPLY | 12 V to 30 V, 120 mA. |
| POWER UP TIME | < 0.5 seconds |
| TEMPERATURE LIMIT | Operating +5 °C to +50 °C Storage -10 °C to +70 °C |
| OUTSIDE LENGTH/INTERNAL TRANSMITTER AND RECEIVER SEPARATIC | 135 mm (5.31 in) / 80 mm (3.15 in) DN |
| SEALING | IPX8 |
| MOUNTING | Single M10/M12 fixing. M4 mounting holes also provided |
| | NCi-4 |

¥ See INTERFACES section for more details.

NC2 tool breakage detection

The NC2 is a compact 2-axis non-contact broken tool detection device, featuring the proven MicroHole™ technology.

A cost-effective solution for many users, the NC2 is especially suitable for use in unmanned machining operations, where tool damage can cause costly scrap or re-working.

Broken tools as small as 0.15 mm diameter can be detected anywhere along the laser beam. Set-up is simple with the built-in adjuster block.

The NC2 features an integral interface which processes signals between the device and the CNC control.



25 (0.98)

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All dimensions are in mm (in).

NC2 features and benefits:

- Detection of tools as small as Ø0.15 mm
- · Short cycle times
- Ultra-compact overall length of just 135 mm, with a laser beam length of 85 mm

| | NC2 |
|--|--|
| PRINCIPAL APPLICATION | High speed, non-contact broken tool detection on vertical machining centres |
| LASER TYPE | Visible red light <1 mW 670 nm. Conforms to American (21 CRF 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50 dated July 26, 2001) and European (IEC 60852-1:1993 + A1: 1997 + A2: 2001) laser safety standards |
| LASER BEAM ALIGNMENT | Adjuster pack – supplied. Options available. |
| ELECTRICAL CONNECTION ARRANGEMENT | Hard-wired |
| TRANSMISSION TYPE | Hard-wired |
| MINIMUM TOOL DIAMETER FOR BREAKAGE DETECTION | Ø0.15 mm (0.006 in) or larger |
| AIR PROTECTION SYSTEM | Supply pressure greater than 3 bar, air usage 6 litres / min. Supply must conform to ISO 8573-1 : Air quality class 5.7 – nylon piping included. |
| POWER SUPPLY | 10 Vdc to 30 Vdc, 35 mA max. |
| POWER UP TIME | < 0.5 seconds |
| TEMPERATURE LIMIT | Operating +5 °C to +50 °C Storage -10 °C to +70 °C |
| OUTSIDE LENGTH/INTERNAL TRANSMITTER AND RECEIVER SEPARATION | 135 mm (5.31 in) / 80 mm (3.15 in) N |
| WEIGHT | 0.75 kg (1.65 lb) |
| SEALING | IPX8 with air on |
| MOUNTING | Single M10/M12 fixing. M4 mounting holes also provided |

TS27R

The TS27R is the standard contact tool setting probe for machining centre applications. A compact, robust design allows simple fitting to the machine bed or bracket mounting where appropriate.

TS27R features and benefits:

- Cost-effective tool setting for all types of machining centres
- Tool length and diameter accurately
 measured on the machine
- Stylus protected by weak link preventing damage in the event of a collision



| | TS27R | | | |
|--|--|---|--|-------------------------------|
| PRINCIPAL APPLICATION | Vertical machining centres | | | |
| TRANSMISSION TYPE | Hard wired | | | |
| PROBING DIRECTIONS | Omni-directional | : ±X, ±Y, +Z | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (20) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | | |
| WEIGHT | 650 g (23 oz) | | | |
| TRIGGER FORCE (factory setting) Lowest force Highest force | Not adjustable 1.3 N (130 gf) 4.6 ozf 2.4 N (240 gf) 8.5 ozf | | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±10° 5.5 mm (0.21 in) |) | | |
| MAX RECOMMENDED STYLUS LENGTH | Cranked stylus 27 x 33 mm (1.06 x 1.3 in) | | | |
| SEALING | IPX8 | | | |
| MOUNTING | Ø12.7 mm (0.5 in) T bolt (not supplied) Optional spiral pins to allow accurate remounting | | | |
| COMPATIBLE INTERFACE [¥] | MI8 or MI8-4 | | | |
| ¥ See INTERFACES section for more details. | ‡ Test conditions: | stylus length: stylus velocity in centre of stylus: stylus force: | 35 mm 480 mm/min factory setting | 1.38 in 18.90 in/min js |

CNC lathe and grinder inspection probing systems

Applications

Renishaw probes can be used on lathes and grinders for component setting and inspection applications.



Component setting

The probe identifies the position of the workpiece, automatically updating work offsets, enabling parts to be manufactured right first time.

This can also be used for:

- part identification for FMS installations.
- component location and also misload detection to avoid scrap.
- excess material identification to bring the cutter to the component fast and safely.

First-off inspection

Inspection of the first component in a batch on the machine tool to:

- reduce the time the machine is idle awaiting feedback from an off-line inspection device.
- · correct any errors automatically.

In-process inspection

Measure components following rough machining to:

- · ensure critical final cuts are correct.
- highlight errors before they become faults.

Post-process inspection

Inspection of the part once the machining is completed. This can be used to:

- provide information to certify that the component is within its specification.
- record part dimensions for statistical process control.

Probe selection

On lathes, inspection probes require a remote transmission system. On grinders, the probe is typically hard-wired to the CNC. (see section 2, Transmission selection).

The next page shows some of the most common lathe and grinder inspection probe applications:

- **1.** A small, horizontal lathe fitted with an **LP2** probe using the **LTO2** optical transmission.
- **2.** A grinder fitted with a hard-wired **LP2H** probe, allowing the use of longer styli.
- The RMP60 probe has been designed for workpiece measurement and job set-up on medium to large horizontal, vertical and gantry machining centres, 5-axis machines, twin spindle machines and vertical turret lathes (VTL).

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Probing systems for **CNC** machine tools

1. A small horizontal lathe fitted with an LP2 probe using the LTO2 optical transmission module. In this installation, signal transmissions are via an OMM and a separate MI12 interface.





2. A tool grinder fitted with a hard-wired high spring force LP2H probe. This allows the use of longer styli than the standard LP2 and has a double diaphragm for use in grinding environments.



3. A large vertical turret lathe fitted with an RMP60 radio probe (refer to the CNC machining centre and milling machine inspection probing systems section for more details).













LP2 / LP2H

The LP2 and LP2H are high-performance, compact probes suitable for inspection and tool setting applications. The LP2H has a higher spring force, allowing the use of longer styli. It has greater resistance to machine vibration.

The LP2 and LP2H are suitable for attaching to the LTO2 family of optical transmission systems, as well as those using inductive transmission. They can also be hard-wired for grinder inspection applications.



All dimensions are in mm (in).

| | LP2 | | LF | LP2H | |
|--|---|---|--|--|--|
| PRINCIPAL APPLICATION | Horizontal lathes | Horizontal lathes | | Horizontal lathes | |
| PROBING DIRECTIONS | Omni-directional | Omni-directional: $\pm X$, $\pm Y$, $+Z$ | | Omni-directional: ±X, ±Y, +Z | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | 2. | 0 μm (0.00008 in) | |
| WEIGHT | 65 g (2.3 oz) | | 65 | 65 g (2.3 oz) | |
| TRIGGER FORCE (factory setting) XY plane - lowest force XY plane - highest force +Z direction | Adjustable 0.50 N (50 gf) 1.76 ozf 0.90 N (90 gf) 3.17 ozf 5.85 N (585 gf) 20.6 ozf | | No 2 4 30 | Not adjustable 2 N (200 gf) 7.05 ozf 4 N (400 gf) 14.1 ozf 30 N (3000 gf) 6.6 lbf | |
| STYLUS OVERTRAVEL XY plane +Z direction | ±12.5° 6.5 mm (0.25 in) | | ±1 5. | ±12.5° 5.0 mm (0.20 in) | |
| STANDARD STYLUS LENGTH MAXIMUM STYLUS LENGTH | 50 mm (1.97 in) 100 mm (3.94 in) | | 50 15 | 0 mm (1.97 in) 50 mm (5.91 in) | |
| SEALING | IPX8 | IPX8 IP | | X8 | |
| MOUNTING | M16 thread for connection to LTO family, extension bars and adaptors. | | | ion bars and adaptors. | |
| COMPATIBLE INTERFACE [¥] | OMI or OMM / MI12 if fitted with LTO2S / LTO2T / LTO3T / LTO2 MI5 / MI8 / MI8-4 if hard-wired MI5 if fitted with inductive transmission | | | | |
| ¥ See INTERFACES section for more details. | Test conditions: | Stylus length: Stylus velocity: Stylus force: | 35 mm 480 mm/min Factory setting | 1.37 in 18.90 in/min Is | |

FS1i and FS2i

The FS1i and FS2i are female sockets, used for holding the LP2 or LP2H probes.

The **FS1i** can be radially adjusted by $\pm 4^{\circ}$ for aligning the square stylus tip to the machine axes, where the **FS2i** is for fixed applications that do not require adjustment.

Powered from a 12 V to 30 V supply, they contain an integral interface which converts the probe's signal into a voltage-free solid state relay (SSR) output for transmission to the CNC machine control.

With the built-in interface and compact size of \emptyset 25 mm x 45.5 mm in length, these sockets eliminate the need for a separate interface within the control cabinet, making installation simple.

FS1i adjustable female socket



FS2i fixed female socket



All dimensions are in mm (in).

| | FS1i | FS2i |
|-----------------------|--|--|
| PRINCIPAL APPLICATION | Adjustable female socket with integral interface used for holding the LP2 and LP2H probes | Fixed female socket with integral interface used for holding the LP2 and LP2H probes |
| LENGTH | 45.5 mm (1.79 in) | 45.5 mm (1.79 in) |
| DIAMETER | 25 mm (0.98 in) | 25 mm (0.98 in) |
| WEIGHT | 70 g (2.4 oz) | 70 g (2.4 oz) |
| STORAGE TEMPERATURE | -10 °C to +70 °C | -10 °C to +70 °C |
| OPERATING TEMPERATURE | +10 °C to +40 °C | +10 °C to +40 °C |
| IP RATING | IPX8 | IPX8 |
| CABLE | 4-core screen cable with polyurethane sheath. Each core 7/0.2 insulated. Ø4.35 mm (0.17 in) × 1.0 m (3 ft 3 in) | 5-core screen cable with polyurethane sheath. Each core 7/0.2 insulated. Ø4.35 mm (0.17 in) × 1.0 m (3 ft 3 in) |
| SUPPLY VOLTAGE | 12 V to 30 V | 12 V to 30 V |
| SUPPLY CURRENT | 18 mA nominal, 25 mA max | 18 mA nominal, 25 mA max. |
| MAX. OUTPUT CURRENT | 50 mA | 50 mA |
| OUTPUT TYPE | Voltage-free SSR | Voltage-free SSR |
| PROTECTION | Short circuit protected output The interface must be powered from a suitably fused supply. | Short circuit protected output. The interface must be powered from a suitably fused supply |

LTO2S / LTO2T / LTO3T / LTO2 optical transmissions

The LTO family with optical transmission is ideal for turret mounting on all CNC lathes.

All LTO units can be fitted with LP2 or LP2H probes.





All dimensions are in mm (in).

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| | LT02S | LTO2T | LTO3T | LTO2 |
|---|---|--|--|--|
| TRANSMISSION TYPE [†] | Uni-directional infra-red o | ptical transmission | | |
| PRINCIPAL APPLICATION | Large/medium lathes | Medium lathes | Medium lathes | Small lathes |
| TURN ON/OFF METHOD | Optical on/optical off or optical on/timer off | Optical on/optical off or optical on/timer off | Optical on/optical off or optical on/timer off | Optical on/timer off |
| WEIGHT (including probe) | 835 g | 625 g | 680 g | 355 g |
| BATTERY TYPE AND LIFE Standby 5% usage Continuous life | 6LR61 (PP3 9 V alkaline) 365 days 80 – 98 days 110 – 140 hours | DL123A 108 days 42 – 45 days 81 – 88 hours | DL123A (2 pieces) 280 days 110 – 114 days 183 – 225 hours | DL123A 65 days 35 days 88 hours |
| SEALING | IPX8 | IPX8 | IPX8 | IPX8 |
| SHANKS | Various Ø25.4 mm (1 in) | Ø25 mm (0.98 in) Ø25.4 mm (1 in) | Ø25 mm (0.98 in) | Ø25 mm (0.98 in) |
| COMPATIBLE INTERFACE [¥] | OMI or OMM/MI12 | OMI or OMM/MI12 | OMI or OMM/MI12 | OMI or OMM/MI12 |

† See TRANSMISSION SYSTEMS section for more details.

¥ See INTERFACES section for more details.

Extension bars and adaptors are also available for special applications.



Lathe and grinder 5.5

inspection

Inductive transmission

Inductive transmission is not recommended for retrofit installations. Machine builders should contact their Renishaw supplier for further details or visit website www.renishaw.com.

CNC lathe tool setting probing systems

Applications

Renishaw probes can be used on lathes for tool setting and tool breakage detection applications.



Tool setting

Tools are driven against the probe stylus with the tool either static or rotating:

- Static setting in X and Z directions for turning tools, part off tools etc.
- Rotating length and/or diameter setting in X and Z directions for powered tools such as drills, taps and slot drills.

Tool breakage detection

Rapid checking of tool dimensions to ensure that tools are still intact after machining.

Probe selection

Typically, tool setting probes cannot remain inside the machine frame of a lathe when not in use – they would obstruct the operation of the machine. However, Renishaw has developed a range of tool setting arms which allows a probe to be placed near the tools only when it is needed. Renishaw's lathe tool setting systems allow manual and fully automatic operation. Manual arms can be removed by hand, whilst automatic arms can be actuated by program commands.

Whether manual or automatic, all Renishaw tool setting arms provide a highly repeatable location for the probe. Manual systems are most suitable where tool set-ups are relatively infrequent. A fully automatic system is ideal where batch changeovers are frequent, or where in-process tool breakage detection is required to support unmanned operation. The next page shows some of the most common tool setting probe applications on lathes:

- 1. A typical horizontal lathe fitted with an **HPRA** manual tool setting arm.
- 2. The HPPA shown in a horizontal lathe.
- **3.** The same lathe fitted with a **HPMA** automatic tool setting arm.

Renishaw tool setting probes can also be purchased separately for use in special applications.

The Renishaw range includes:

- **RP3** a compact 5-axis tool setting probe, ideal for arm applications.
- LP2 a high specification probe for specialist applications.



1. A **horizontal lathe** fitted with an HPRA manual tool setting system. The HPRA is locked to a permanent base when in use, and can be stored on a stand outside the machine tool when not required.



2. A **horizontal lathe** fitted with the HPPA manual operated 'pull down, push up' system, which is permanently located within the turning centre.



3. A horizontal lathe fitted with the HPMA automatic tool setting system. The HPMA remains inside the machine tool all the time, manoeuvring the tool setting probe into position when needed – under program control.









HPRA

High precision removable arm

The HPRA is a 'plug-in' arm which is manually located inside the machine for tool setting, and then removed once the process is complete.

The arm is locked into a repeatable kinematic location on a mounting base during operation, enabling the probe stylus to be re-located to within 5 μ m (2 σ).

When not in use the HPRA is stored on a stand located on or near the machine.



All dimensions are in mm (in).

| | HPRA | | | |
|---|--|--|--------------------------------------|--|
| PRINCIPAL APPLICATION | Tool setting on 2-axis and 3-axis lathes | | | |
| TYPICAL POSITIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 5.0 μm 2σ 8.0 μm 2σ | 0.0002 in (Arm 0.0003 in (Arm | s for machi s for machi | ines with 6 in to 15 in chucks) ines with 18 in and 24 in chucks) |
| ARM DIMENSIONS A B S (50 mm tooling) | Maximum 580 mm (22.85 450 mm (17.73 71 mm (2.80 ir | 5 in) 3 in) 1) | | |
| ARM DIMENSIONS A B S (16 mm tooling) | Minimum 250 mm (9.84 211 mm (8.31 35.7 mm (1.41 | in) in) in) | | |
| BASE DIAMETER | 85 mm (3.35 ir | ו) | | |
| SEALING | IPX8 | | | |
| PROBE | RP3 | | | |
| COMPATIBLE INTERFACE [¥] | TSI 2 | | | |
| ¥ See INTERFACES section for more details. | ‡ Test conditions | s: stylus length: stylus velocity: stylus force: | 22 mm 36 mm/min factory settir | 0.87 in 1.42 in/min ngs |

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HPPA

High precision pull-down arm

The HPPA is a simple, manually operated 'pull-down, push-up' system, which is permanently located within the turning centre and readily available for tool setting operations.

An innovative patented rotary device automatically locks the arm into a kinematic location, with no additional adjustment or locking device required. This enables the probe's stylus to be re-located to within $5 \ \mu m (2\sigma)$.



All dimensions are in mm (in).

HPPA

| PRINCIPAL APPLICATION | Tool setting on 2-axis and 3-axis lathes | | | | |
|---|--|--|--|--|--|
| TYPICAL POSITIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 5.0 μ m 2 σ x/z 0.0002 in (Arms for machines with 6 in to 15 in chucks) 8.0 μ m 2 σ x/z 0.0003 in (Arms for machines with 18 in and 24 in chucks) | | | | |
| ARM DIMENSIONS | Maximum | | | | |
| A | 555 mm (21.87 in) | | | | |
| В | 458.2 mm (18.04 in) | | | | |
| S (50 mm tooling) | 71 mm (2.80 in) | | | | |
| ARM DIMENSIONS | Minimum | | | | |
| A | 250 mm (9.84 in) | | | | |
| В | 219.2 mm (8.63 in) | | | | |
| S (16 mm tooling) | 35.7 mm (1.41 in) | | | | |
| SEALING | IPX8 (static) | | | | |
| PROBE | RP3 | | | | |
| COMPATIBLE INTERFACE [¥] | TSI 2 | | | | |
| ¥ See INTERFACES section for more details | Test conditions: stylus length: 22 mm 0.87 in | | | | |

stylus velocity: stylus force: 22 mm 0.87 in 36 mm/min 1.42 in/min factory settings

НРМА

High precision motorised arm

The HPMA is an electrically powered arm allowing precision automated tool setting.

Rapid actuation allows in-process tool setting and broken tool detection without the need for operator intervention.

The arm swings down under program control and locks into position within 2 seconds.

After the tools have been set, a program command returns the arm to a safe position away from the machining operations.

An innovative patented rotary device automatically locks the arm into a kinematic location, with no additional adjustment or locking device required.

The HPMA is available in a range of standard arm dimensions. Alternatively, customised arms can be specified within the dimension limits outlined below.

All dimensions are in mm (in).

| PRINCIPAL APPLICATION | Tool setting and tool breakage detection on 2-axis and 3-axis lathes | | | | |
|---|--|--|--|--|--|
| TYPICAL POSITIONAL | 5.0 μ m 2 σ x/z 0.0002 in (Arms for machines with 6 in to 15 in chucks) | | | | |
| REPEATABILITY | 8.0 μm 2σ x/z $$ 0.0003 in (Arms for machines with 18 in and 24 in chucks) | | | | |
| ARM DIMENSIONS | Maximum | | | | |
| A | 555 mm (21.85 in) | | | | |
| В | 458.2 mm (18.04 in) | | | | |
| S (50 mm tooling) | 71 mm (2.8 in) | | | | |
| ARM DIMENSIONS | Minimum | | | | |
| A | 250 mm (9.84 in) | | | | |
| В | 219.2 mm (8.63 in) | | | | |
| S (50 mm tooling) | 35.7 mm (1.4 in) | | | | |
| SEALING | IPX8 (static) | | | | |
| PROBE | RP3 | | | | |
| COMPATIBLE INTERFACE [¥] | TSI 3 | | | | |
| ¥ See INTERFACES section for more details | trest conditions: stylus length: 22 mm 0.87 in | | | | |
| | stylus velocity: 36 mm/min 1.42 in/min | | | | |

stylus force:

factory settings

номл

C Lathe tool setting



RP3 probe

For Renishaw HP tool setting arms

The RP3 probe has been designed primarily for tool setting applications but can also be used in workpiece setup.

The RP3 probe is suitable for OEM installation into purpose built holders. It utilises a universal M4 stylus mounting, allowing the full range of Renishaw styli to be used.

When fitting the RP3 to an OEM tool holder, an OEM kit is available that enables easy connection from the probe connection terminals to the interface cable (for further details, please contact your local Renishaw office).

The probe is extremely short, resulting in significant advantages in tool setting applications and has the performance of traditional Renishaw touch trigger probes.



All dimensions are in mm (in).

RP3

| PRINCIPAL APPLICATION | Manual and automatic tool setting arms on 2-axis and 3-axis lathes | | |
|--|--|--|--|
| TRANSMISSION TYPE [†] | Hard-wired | | |
| PROBE OUTPUTS | OEM kit including connection PCB | | |
| PROBING DIRECTIONS | Omni-directional: ±X, ±Y, +Z | | |
| UNI-DIRECTIONAL REPEATABILITY MAX (2σ) AT STYLUS TIP [‡] | 1.0 μm (0.00004 in) | | |
| WEIGHT | 80 g (3 oz) | | |
| TRIGGER FORCE (factory setting) Lowest force Highest force +Z direction | not adjustable 1.5 N (150 gf) 5.3 ozf 3.5 N (350 gf) 12.3 ozf 12.0 N (1200 gf) 42.3 ozf | | |
| STYLUS OVERTRAVEL XY plane +Z direction | ± 9 ° 2 mm (0.8 in) | | |
| MAX RECOMMENDED STYLUS LENGTH | 48.25 mm (1.90 in) | | |
| SEALING | IPX8 | | |
| MOUNTING | Refer to the user guide for customer integration details | | |
| COMPATIBLE INTERFACE [¥] | MI8-4 | | |
| † See TRANSMISSION SYSTEMS section for more details. ¥ See INTERFACES section for more details. | ‡ Test conditions: stylus length: 35 mm tylus velocity: 8 mm/sec 0.31 in/sec stylus force: factory settings | | |

Machine interface units

MI12/MI12E/MI12-B (Optical transmission)

The MI12 and MI12-B interfaces process signals between one or two OMMs and the CNC machine control.

The standard MI12 unit is contained within a free-standing enclosure with an optional panel mounting kit also available. The MI12-B is a board-only version for mounting within the machine cabinet.

The MI12E interface forms part of the high power optical transmission system. It processes signals between one or two OMMEs and the CNC machine's control. For optimum system performance, the MI12E should only be used with OMME(s) and the MP10E (or MP700E).

MI12 and MI12E



MI12-B



All dimensions are in mm (in).

| PRINCIPAL APPLICATION | Optical transmission probing systems on machining centres and lathes | | |
|--|---|---|--|
| MOUNTING | Free-standing enclosure (optional panel mount available) The MI12-B has self-adhesive feet or M4 support studs | | |
| SYSTEM STATUS | Audible indicator Error LED | 'Bleeper' Illuminated when the beam is obstructed, the probe is out of range, or the probe is off | |
| | Low battery LED Probe status LED | Indicates probe batteries should be replaced Illuminated when the probe is seated. Off when the stylus is deflected | |
| | Power LED Start button | Illuminated when power is on Manual-start push-button on the front of the interface | |
| MACHINE START OPTIONS | 1. Machine start | OMM / OMME sends a start signal when commanded by the machine control | |
| | 2. Auto start | OMM / OMME sends a start signal once every second when the probe is not transmitting | |
| OUTPUTS | Four solid state relay (SSR) 1. Probe status (or compleme 2. Probe skip (or compleme 3. Probe error (or compleme 4. Low battery | outputs ent) it) nt) | |
| OUTPUT SIGNAL FORMAT Maximum current Maximum voltage | Output signals must be compatible with the machine control input ±50 mA ±50 V peak | | |
| OTHER I/O Maximum current Maximum voltage Output duration | Remote audible indicator or lamp (not supplied by Renishaw) 100 mA +50 Vdc 44 ms | | |
| POWER SUPPLY | The interface can draw its supply from the CNC +15 V to + 30 Vdc and presents a load of up to 400 mA Alternatively, the Renishaw PSU3 power supply unit can be used | | |

MI12 / MI12-B / MI12E

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MI5 (Inductive transmission)

The MI5 interface processes signals from Renishaw inductive probes and converts the signals into voltage-free solid-state relay (SSR) output, for transmission to the machine's controller.



| | MI5 | | |
|--|---|---|--|
| PRINCIPAL APPLICATION | Inductive probing systems on machining centres and lathes | | |
| MOUNTING | Free-standing enclosure | | |
| SYSTEM STATUS | Audible indicator Probe Status LED | 'Bleeper' On when the probe is seated. Off when the stylus is deflected or power is off | |
| OUTPUT | 1. Probe Status (or compl 2. Probe Skip (or compler | ement) nent) | |
| OUTPUT SIGNAL FORMAT Maximum current Maximum voltage | Solid state relay (SSR) 40 mA peak ±50 V peak | | |
| POWER SUPPLY | The MI5 can draw its supply from the CNC +18 V to + 30 Vdc The MI5 presents a load of up to 200 mA Alternatively, the Renishaw PSU3 power supply unit can be used | | |

MI8 (Hard-wired transmission)

The MI8 interface processes signals from Renishaw hard-wired probes and converts the signals into a voltage-free solid-state relay (SSR) output for connection to the machine's controller. All dimensions are in mm (in).



| | MI8 | | |
|--|--|--|--|
| PRINCIPAL APPLICATION | Hard-wired probing systems on machining centres and lathes | | |
| MOUNTING | Self adhesive feet, M4 studded support or DIN rail mounting | | |
| SYSTEM STATUS | Probe status LED On when the probe is seated. Off when the stylus is deflected or power is off | | |
| OUTPUT | 1. Probe Status/Status Bar – configurable | | |
| OUTPUT SIGNAL FORMAT Maximum current Maximum voltage | Solid state relay (SSR) 50 mA peak ±50 V peak | | |
| OTHER I/O | Outputs are available for a remote probe status LED (not supplied by Renishaw). Nominal current is 10 mA | | |
| POWER SUPPLY | The MI8 can draw its supply from the CNC +15 V to + 30 Vdc The MI8 presents a load of up to 50 mA Alternatively, the Renishaw PSU3 power supply unit can be used | | |

MI8-4

(Hard wired transmission)

The MI8-4 interface processes the probe signal from a hard-wired probe and converts it to the correct format for connection to a controller's probe input.

The MI8-4 can also be connected to the 4-wire Fanuc automatic measurement input (XAE, ZAE). Four signals are required from the control to determine which of the four outputs should generate the probe's signal.



All dimensions are in mm (in).



| | MI8-4 | | |
|--|--|--|--|
| PRINCIPAL APPLICATION | Hard-wired probing systems on machining centres and lathes | | |
| MOUNTING | Self-adhesive dual-locked fixing or DIN rail mounting | | |
| SYSTEM STATUS | Probe status LED Four diagnostic LEDs | Green when probe is seated. Red when stylus is deflected. Off when power is off. Illuminated to indicate direction of machine movement | |
| | | (for use with 4-wire output option). | |
| STANDARD OUTPUT | 1. Probe status (or complement) | | |
| STANDARD OUTPUT SIGNAL FORMAT | Probe status output is an isolated totem-pole output which requires a 3-wire connection: signal, power and ground | | |
| TTL COMPATIBILITY Vout high Vout low | Probe status output is TTL compatible with a 5 V \pm 5% supply voltage. If this supply voltage is not available another voltage in the range 4.75 V to 30 V can then be used 2.5 V min at 2.5 mA 0.4 V max at 10 mA | | |
| FANUC '4-WIRE' OUTPUTS | X- output (or complement) X+ output (or complement) Z- output (or complement) Z+ output (or complement) | | |
| '4-WIRE' OUTPUT FORMAT | Four wire outputs are totem-pole outputs supplied by the +15 V to +30 V power supply to the MI8-4 Four 'machine axis moving' inputs to the MI8-4 are open-collector transistor (OCT), totem-pole and relay compatible | | |
| OTHER I/O | An inspection probe system output can be connected to the MI8-4 and then routed to the machine control. The selection of probe is controlled by a machine control input to the MI8-4 (M code) | | |
| POWER SUPPLY | The MI8-4 can draw its supply from the CNC +15 V to + 30 Vdc. A voltage of +16.5 V to +28.5 V with 3 V peak ripple is also acceptable The MI8-4 presents a load of up to 80 mA (each XAE, ZAE output connection will add to the supply current) | | |

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NCi-4 (for non-contact products)

The NCi-4 interface is used with the NC1, NC3 and NC4 non-contact tool setting systems, processing their signals and converting them into a voltage-free solid-state relay (SSR) outputs for transmission to the CNC machine's control.

The NCi-4 features a drip-rejection mode, allowing it to filter out random drops of coolant without triggering the system.



Interfaces



NCi-4

| PRINCIPAL APPLICATION | The NCi-4 processes signals from the NC1, NC3 or NC4 and converts them into a voltage-free solid state (SSR) output, which is transmitted to the CNC machine control. | |
|--|--|--|
| DIMENSIONS | Compact size 130 mm (5.12 in) x 98 mm (3.86 in) x 35 mm (1.38 in) | |
| SUPPLY VOLTAGE | 11 V to 30 Vdc | |
| SUPPLY CURRENT - NC3 or NC4 CONNECTED | 120 mA @ 12 V, 70 mA @ 24 V | |
| SUPPLY CURRENT - NC1 CONNECTED | 300 mA @ 12 V, 130 mA @ 24 V | |
| OUTPUT SIGNAL | Two voltage-free solid-state relay (SSR) outputs, configurable normally-open or normally-closed, one of which can be configured pulsed or level. | |
| AUXILIARY RELAY | Auxiliary relay for skip-sharing with a spindle probe system or controlling the transmitter separately from the receiver | |
| TEMPERATURE OPERATING | a + 5 °C to + 50 °C | |
| TEMPERATURE STORAGE | -10 °C to + 70 °C | |
| POWER SUPPLY | 12 V to 30 V | |
| MOUNTING | DIN rail. Alternative mounting using screws | |
| INPUT/OUTPUT PROTECTION | SSR outputs protected by 50 mA resettable fuses. Auxiliary relay output protected by a 200 mA resettable fuse | |
| DIAGNOSTIC LEDs | Beam status, latch mode, high-speed tool-breakage detection mode, auxiliary relay, tool setting mode | |
| MODES OF OPERATION | High-speed tool-breakage detection mode. Normal measurement mode. Latch mode for profile checking and cutting edge checking. Drip-rejection mode – rejects random drops of coolant falling through the beam. | |
| | | |

The TSI2 and TSI2-C interfaces process signals between the HPRA and HPPA tool setting arms and the machine's control.

The units are DIN rail-mounted and feature an 'easy fit' location mechanism.

The TSI2 interface is designed to be used with all standard +24 Vdc operated controllers e.g. Fanuc, Siemens etc.

For controllers that do not operate from standard +24 Vdc power supplies, e.g. OSP and Haas, the TSI2-C should be used instead. This features configurable solid state relay (SSR) outputs that are easily integrated into all non +24 V controllers.



| | TSI2 | TSI2-C |
|----------------------------------|---|--|
| PRINCIPAL APPLICATION | Hard-wired tool setting probe applications with HPRA and HPPA | Hard-wired tool setting probe applications with HPRA and HPPA |
| MOUNTING | DIN rail mounting | DIN rail mounting |
| STANDARD OUTPUTS | S1. Probe status (no complement)2. Position confirm signals (Machine Ready and Arm Ready) | Probe status Position confirm signals (Machine Ready and Arm Ready) |
| STANDARD OUTPUT SIGNAL FORMAT | Unipolar active-high probe status outputs (non-configurable) Unipolar active-high confirm outputs for Machine Ready and Arm Ready positions (non-configurable) | Voltage-free, solid-state relay (SSR) probe status output (Normally Open and Normally Closed option available) Voltage-free, solid-state relay (SSR) confirm outputs for Machine Ready and Arm Ready positions (non-configurable) |
| TTL COMPATIBILITY | Not compatible | Probe Status output is voltage-free and compatible with TTL inputs |
| STANDARD INPUTS | 1. Inhibit 2. Probe Select inputs | 1. Inhibit 2. Probe Select inputs |
| STANDARD INPUT SIGNAL FORMAT | 1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH | Internally pulled down (2k4) ACTIVE HIGH Internally pulled down (2k4) ACTIVE HIGH |
| PROBE VIBRATION FILTER | A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI2 (PL2-1 and PL2-3) | A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI2-C (PL2-1 and PL2-3) |
| POWER SUPPLY | 18 V – 30 Vdc Imax = 50 mA not including output loading. Fuse protected at 250 mA (FF). | 18 V – 30 Vdc, Imax = 120 mA Fuse protected at 250 mA (FF). |

All dimensions are in mm (in).

RENISHAW apply innovation[™]

TSI3 and TSI3-C (for tool setting arms)

The TSI3 and TSI3-C interfaces process signals between the motorised HPMA tool setting arm and the machine's control.

These units are DIN rail-mounted and feature an 'easy fit' location mechanism.

The TSI3 interface is designed to be used with all standard +24 Vdc operated controllers e.g. Fanuc, Siemens etc.

For controllers that do not operate from standard +24 Vdc power supplies, e.g. OSP and Haas, the TSI3-C should be used instead. This features configurable solid state relay (SSR) outputs that are easily integrated into all non +24 V controllers.



TSI3/TSI3-C

| | TSI3 | TSI3-C | |
|----------------------------------|--|--|--|
| PRINCIPAL APPLICATION | Hard-wired tool setting probe applications with HPMA | Hard-wired tool setting probe applications with HPMA | |
| MOUNTING | DIN rail mounting | DIN rail mounting | |
| STANDARD OUTPUTS | S1. Probe status (no complement)2. Position confirm signals (Machine Ready and Arm Ready) | Probe status (no complement) Position confirm signals (Machine Ready and Arm Ready) | |
| STANDARD OUTPUT SIGNAL FORMAT | Unipolar active-high probe status outputs (non-configurable) Unipolar active-high confirm outputs for Machine Ready and Arm Ready positions (non-configurable) | Voltage-free, solid-state relay (SSR) probe status output (Normally Open and Normally Closed option available) Voltage-free, solid-state relay (SSR) confirm outputs for Machine Ready and Arm Ready positions (non-configurable) | |
| TTL COMPATIBILITY | Not compatible | Probe Status output is voltage-free and compatible with TTL inputs | |
| STANDARD INPUTS | Inhibit, Arm Ready command, Machine Ready command Probe Select inputs | Inhibit, Arm Ready command, Machine Ready command Probe Select inputs | |
| STANDARD INPUT SIGNAL FORMAT | 1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH | 1. Internally pulled down (2k4) ACTIVE HIGH 2. Internally pulled down (2k4) ACTIVE HIGH | |
| PROBE VIBRATION FILTER | A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI3 (PL2-1 and PL2-3) | A trigger delay circuit (6.5 ms) can be activated by reversing the brown and white wire connections to the TSI3-C (PL2-1 and PL2-3) | |
| POWER SUPPLY | Interface voltage supply (1, 13, 25) 18 V – 30 Vdc, Imax = 100 mA not including output loading. Motor voltage supply (10, 22, 11, 23) 24 Vdc + 20% -10%, Imax + 2.5 A for 4 s (worst case stall). Overcurrent and reverse connection protected. Self-resettable | Interface voltage supply (1, 13) 18 V - 30 Vdc, Imax = 140 mA Motor voltage supply (10, 22, 11, 23) 24 Vdc + 20% -10%, Imax + 2.5 A for 4 s (worst case stall). Overcurrent and reverse connection protected. Self-resettable | |
| DIAGNOSTIC LEDS | | 1. Motor state LED 2. Arm state LED | |

Taper shanks for machine tool probes

Shanks for RMP60 / OMP60 (when not used in shank switch configuration) MP10 / MP10E / MP12 (non-shank switch version) MP700 / MP700E probes

- Please quote the part number when ordering equipment
- Shanks are supplied in a natural finish
- Dimensions mm (in)
- If you cannot find the shank you require, please contact your local Renishaw office for further details



HSK shanks



Gauge line

| Shank type | Part no. | Taper | Gauge length A |
|-----------------------------|-------------|-------|----------------|
| DIN 69871 A | M-2045-0064 | 30 | 35.25 (1.388) |
| | M-2045-0065 | 40 | 35.25 (1.388) |
| | M-2045-0067 | 50 | 35.25 (1.388) |
| BT - 1982 | M-2045-0077 | 30 | 27.5 (1.083) |
| | M-2045-0027 | 40 | 32.0 (1.260) |
| | M-2045-0073 | 50 | 38.0 (1.496) |
| ANSI CAT B5.50-1985 | M-2045-0137 | 40 | 35.25 (1.388) |
| (Imperial pull stud thread) | M-2045-0139 | 50 | 35.25 (1.388) |
| ANSI CAT B5.50-1985 | M-2045-0208 | 40 | 40.00 (1.575) |
| (Metric pull stud thread) | M-2045-0238 | 50 | 35.25 (1.388) |
| DIN 2080 | M-2045-0132 | 30 | 20.0 (0.787) |
| (Manual tool change) | M-2045-0024 | 40 | 13.6 (0.535) |
| | | | |

| Shank type | Part no. | HSK | Gauge length A | | | | | | |
|----------------------|-------------|-------|----------------|--|--|--|--|--|--|
| DIN 69893 HSK Form A | M-2045-0232 | A32 | 46 (1.811) | | | | | | |
| | M-2045-0186 | A40 | 47 (1.850) | | | | | | |
| | M-2045-0187 | A50 | 50 (1.969) | | | | | | |
| | M-2045-0188 | A63 | 53 (2.087) | | | | | | |
| | M-2045-0189 | A80 | 50 (1.969) | | | | | | |
| | M-2045-0190 | A100 | 61 (2.402) | | | | | | |
| DIN 69893 HSK Form E | M-2045-0204 | E40 | 38 (1.496) | | | | | | |
| DIN 69893 HSK Form F | M-2045-0287 | F3 | 53 (2.087) | | | | | | |
| SANDVIK CAPTO | M-2045-0346 | C5 | 32 (1.259) | | | | | | |
| | M-2045-0310 | C6 | 42 (1.654) | | | | | | |
| | M-2045-0311 | C8 | 50 (1.969) | | | | | | |
| KENNAMETAL KM | M-2045-0335 | KM63 | 25.6 (1.07) | | | | | | |
| | M-2045-0344 | KM63Y | 30.0 (1.181) | | | | | | |

Gauge length A

65.00 (2.559)

35.25 (1.388)

41.00 (1.614)

65.00 (2.559)

35.25 (1.388)

41.00 (1.614)

65.00 (2.559)

35.25 (1.388)

35.25 (1.388)

35.25 (1.388)

35.25 (1.388)

Shanks for RMP60/OMP60 probes when used in shank switch configuration

- Please quote the part number when ordering equipment
- Shanks are supplied in a natural finish
- Bobbin supplied with shank
- Dimensions mm (in)
- If you cannot find the shank you require, please contact your local Renishaw office for further details



HSK shanks



Bobbin for shank switch configuration



Part no. A-4038-0303 Shank type Part no. HSK Gauge length A DIN 69893 HSK Form A A-4038-0070 65.00 (2.559) A40 A-4038-0050 62.00 (2.441) A50 A-4038-0063 A63 50.00 (1.969) A-4038-0241 A80 42.50 (1.673) A-4038-0242 A100 45.50 (1.791) DIN 69893 HSK Form E 65.00 (2.559) M-4038-0243 F40 M-4038-0244 E50 62.00 (2.441) M-4038-0245 E63 50.00 (1.969)

Taper

30

40

50

30

40

50

30

40

50

40

50

Shanks for OMP40 probes

- · Please quote the part number when ordering equipment
- Shanks are supplied in a natural finish
- Dimensions mm (in)

Taper shanks

• If you cannot find the shank you require, please contact your local Renishaw office for further details

Gauge length A

| Shank type | Part no. | Taper | Gauge length A | | | | | |
|-----------------------------|-------------|-------|----------------|--|--|--|--|--|
| DIN 69871 A | M-4071-0048 | 30 | 35.25 (1.388) | | | | | |
| | M-4071-0069 | 40 | 41.60 (1.638) | | | | | |
| | M-4071-0070 | 50 | 50.00 (1.969) | | | | | |
| BT - 1982 | M-4071-0049 | 30 | 27 (1.063) | | | | | |
| | M-4071-0057 | 40 | 32 (1.260) | | | | | |
| | M-4071-0071 | 50 | 50 (1.696) | | | | | |
| ANSI CAT B5.50-1985 | M-4071-0050 | 30 | 35.3 (1.39) | | | | | |
| (Imperial pull stud thread) | M-4071-0058 | 40 | 35.3 (1.39) | | | | | |
| | M-4071-0072 | 50 | 35.3 (1.39) | | | | | |
| ANSI CAT B5.50-1985 | M-4071-0073 | 40 | 35 (1.378) | | | | | |
| (Metric pull stud thread) | M-4071-0064 | 50 | 35 (1.378) | | | | | |

HSK shanks



Gauge line

| Shank type | Part no. | HSK | Gauge length A | |
|----------------------|-------------|--|----------------|--|
| DIN 69893 HSK Form A | M-4071-0045 | A32 | 35.00 (1.378) | |
| | M-4071-0046 | A40 | 35.25 (1.388) | |
| | M-4071-0047 | A50 | 42.25 (1.663) | |
| | M-4071-0029 | A63 | 42.00 (1.654) | |
| | M-4071-0075 | A80 | 42.00 (1.654) | |
| | M-4071-0076 | A100 | 45.00 (1.772) | |
| DIN 69893 HSK Form C | M-4071-0085 | C40 | 35.25 (1.388) | |
| DIN 69893 HSK Form E | M-4071-0044 | E25 | 21.25 (1.837) | |
| | M-4071-0055 | E32 | 35.00 (1.378) | |
| | M-4071-0054 | no. HSK Gauge II 771-0045 A32 35.00 (1) 771-0046 A40 35.25 (1) 771-0047 A50 42.25 (1) 771-0029 A63 42.00 (1) 771-0075 A80 42.00 (1) 771-0076 A100 45.00 (1) 771-0076 A100 45.00 (1) 771-0085 C40 35.25 (1) 771-0085 E40 35.25 (1) 771-0044 E25 21.25 (1) 771-0055 E32 35.00 (1) 771-0077 E50 42.00 (1) 771-0078 E63 42.00 (1) 771-0079 F63 42.00 (1) 771-0066 C5 45 (0) 771-0067 C6 45 (0) 771-0065 KM63 30 (1.18) 71-0074 KM63Y 30 (1.18) | | |
| | M-4071-0077 | E50 | 42.00 (1.654) | |
| | M-4071-0078 | E63 | 42.00 (1.654) | |
| DIN 69893 HSK Form F | M-4071-0079 | F63 | 42.00 (1.654) | |
| SANDVIK CAPTO | M-4071-0066 | C5 | 45 (1.772) | |
| | M-4071-0067 | C6 | 45 (0.772) | |
| KENNAMETAL KM | M-4071-0065 | KM63 | 30 (1.181) | |
| | M-4071-0074 | KM63Y | 30 (1.181) | |
| | | | | |

Shanks adapter to fit OMP40 onto MP10 / MP10E / MP11 / MP12 MP700 / MP700E type shanks



| Part No. | Length A | | | | | | | |
|-------------|--------------|--|--|--|--|--|--|--|
| A-4071-0031 | 11 mm (0.43) | | | | | | | |

Accuracy at the point of contact

As industry has developed its requirement for increasingly diverse and complex manufactured parts, inspection systems have had to work hard to keep up. The use of CMMs with probing systems and in-process inspection on machine tools are two of the solutions offered by Renishaw to help you maximise your productivity and maintain the highest possible standards of quality.

Successful gauging depends very much on the ability of the probe's stylus to access a feature and then maintain accuracy at the point of contact. At Renishaw we have used our expertise in probe and stylus design to develop a comprehensive range of CMM and machine tool styli to offer you the greatest possible precision.

Please refer to the styli and accessories technical specification (document H-1000-3200) for more details.

Stylus types

Renishaw's stylus range covers several different types for different applications:

Ruby ball styli

This is the standard stylus for most inspection



applications. A hard, highly spherical tip ensures long life with excellent accuracy.

Ruby balls are available mounted to stems made from a variety of materials including non-magnetic stainless steel, ceramic and a specialised carbon fibre material, Renishaw GF.

Disc styli

These 'thin sections' of a large sphere are used to probe undercuts and grooves.



A simple disc requires datuming on only one diameter (usually a ring gauge), but limits effective probing to only the X and Y directions.

Tool setting styli

Typically fitted with a square tip, tool setting styli can have threaded or plain shaft attachments.



The stylus tip faces are ground to ensure high squareness and parallelism.

Note that the TS27R tool setting probe for machining centres can also be fitted with a tungsten carbide disc stylus.

Stylus accessories

Stylus extensions

Stylus extensions give greater reach and allow access to deep features without risk of damage to the probe.

Crash protection

Renishaw's stylus crash protection devices are designed to break, and protect the probe from damage.

Stylus crank

A crank can allow access to features that are otherwise difficult to reach, and are often used in lathe inspection applications.



Your choice of stylus can have an impact on measurement results. A stylus should be as stiff as possible, so consider the following points:

- **1. Use the shortest stylus** that allows access to all the features that you want to probe.
- Use the largest ball diameter that allows the stylus to enter the smallest internal features. This keeps the stem diameter as large as possible.
- 3. Minimise the number of joints in the stylus assembly.

Regular stylus datuming will ensure that you achieve the best measurement accuracy.

Software

Renishaw has developed probing software for all probing applications on a broad range of machine tool controllers. Refer to the data sheets *Probe software for machine tools – program features* (part no. H-2000-2289) and *Probe software for machine tools – program selection list* (part no. H-2000-2298).

Probing packages available

EasyProbe

EasyProbe software for machining centres provides simple and fast job setup and measuring routines, for operators with minimal programming skill.

Inspection software for machining centres

Basic inspection / job setup software with the ability to set work offsets, update tool offsets and print inspection results (where this control option is available). Suitable for use by an operator or part programmer.

Additional software for machining centres

Several packages to enhance and extend the capabilities of the standard inspection software. Includes vector measuring and angle measure, plus a 5-axis option.

Inspection Plus software for machining centres

A totally integrated package of software that includes vector and angle measure options, print options (where this control option is available) and an extended range of cycles. Includes SPC cycle, 1-touch or 2-touch probing option, tool offset compensation by percentage of error and output data stored in an accessible variable stack.

Rotating tool setting software for machining centres

Uses the industry standard TS27R probe, which suits the majority of applications.

Non-contact tool setting software for machining centres

Preferred for applications using delicate tools, and other applications where the probe must not obstruct the machine's working envelope.

For further software information, please refer to Renishaw part numbers H-2000-2289 and H-2000-2298.

| | Fanuc 0 - 18\21M | Fanuc 0T - 21T | Mazatrol (Mazak) | Mitsubishi Meldas | Yasnac | Fadal | Okuma OSP/U | Haas | Siemens 800 series | Siemens 840D/810D | Selca | GE2000 | Toshiba Tosnuc | Allen Bradley 8600 | Heidenhain | Num | Traub | Hitachi-Seicos | OSAI series 10 |
|----------------------------|------------------|----------------|------------------|-------------------|--------|-------|-------------|------|--------------------|-------------------|-------|--------|----------------|--------------------|------------|-----|-------|----------------|-----------------------|
| Machining centres | | | | | | | | | | | | | | | | | | | |
| Inspection | • | | • | ٠ | • | ٠ | • | ٠ | • | | • | ٠ | • | ٠ | • | | | | • |
| Inspection Plus | • | | • | • | • | | • | ٠ | | • | | | | | | • | | • | |
| Inspection Plus for MP700 | • | | • | • | • | | | • | | • | | | | | | | | • | |
| Tool setting (contact) | • | | • | • | • | • | | • | • | • | • | • | | | | • | | | |
| EasyProbe | • | | | • | • | | | • | | • | | | | | | | | | |
| Tool setting (non-contact) | • | | • | • | • | | • | • | | • | | | | | • | | | • | • |
| Lathes | | | | | | | | | | | | | | | | | | | |
| Inspection | | • | • | • | • | | | • | • | • | | | | | | | • | • | |
| Tool setting | | • | | | | | | • | • | • | | | | | | | • | | |
| 3-axis tool setting | | • | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

10.2



Are you looking to be more competitive? Looking to improve quality whilst reducing costs? Sounds a tall order, but Renishaw has years of experience in doing just this and now, with the release of Productivity+[™], the implementation of probing has just been made easier.

If you've been led to believe time spent probing is time wasted, think again! Renishaw probes will help you automate machine set-ups and machining processes, and reduce inspection costs. In turn, this will increase shop throughput, reduced machine downtime, create dependable production schedules, reduce scrap and rework and most importantly, increase your productivity. Remember, a machine tool is only profitable when it is making good parts, not when it is waiting for a setter /operator or CMM.

The majority of Renishaw customers use our probes to find and establish the position of parts and to update reference systems (work co-ordinates) within the machine's controller. These cycles are fully automated, including the machine controller updates, eliminating human error and the need for an operator.

Another common use for Renishaw probing is to identify metal conditions prior to finish machining. Roughing cuts are made and probed, with the results being fed back to the machine controller. The machine controller then automatically adjusts the final cutter path in accordance with the findings of the probe.

With the seamless merger of these probing routines into the production process, on-machine confidence and machine efficiency can be greatly increased.

PRODUCTIVITY+[™] ACTIVE EDITOR

No CAM? – no problem! The all-in-one, independent solution for producing probing cycles remotely from the machine is here.

Active Editor is a stand-alone PC software package, capable of creating probing cycles ready for machine use. Existing machine programs can be read and probing added, removing the need for cutting and pasting into text editors or on-machine editing.

Easy-to-use dialogues with integrated help make writing probing programs easy. High levels of confidence remove the need for proveout of the post-processed output. Productivity+[™] Active Editor can import existing metal cutting processes and insert Renishaw probing routines for tool setting, tool breakage detection, part set-up, or part inspection through the user-friendly GUI software.

Large arrays of machine tool controller types are supported by Active Editor, via Renishaw post processors. New post processors are continually being developed so please call if your controller is not listed.

GibbsCAM plug-in

Seamlessly integrate probing routines into your manufacturing processes with the Productivity+ GibbsCAM plug-in.

Renishaw's Productivity+[™] GibbsCAM plug-in is the ideal solution for GibbsCAM users wishing to add probing functionality to their software. Designed to operate within GibbsCAM 2004 (Version 7), the Productivity+ GibbsCAM plug-in will enable you to simulate operations on screen and probe with a new level of confidence.

The Productivity+[™] GibbsCAM plug-in brings all the benefits and features of the stand-alone Active Editor package, allowing the user to insert Renishaw probing routines for tool setting, tool breakage detection, part set-up, or part inspection. And by using the familiar GibbsCAM interface, creating routines is made that much easier.

Using the Productivity+[™] GibbsCAM plug-in could not be simpler. The probe is treated simply as another tool in the magazine and probing cycles are created alongside metal cutting operations, becoming an integral part of the development process. The beauty of the Gibbs/Productivity+[™] relationship is the ability to introduce probing to the program before it is post-processed, eliminating the need to edit the file once on the machine. The reduction of manual intervention means less room for mistakes in the program and consequently less time lost looking for errors. Furthermore, the inclusion of collision-detection in the software, preventing the probe from making an inappropriate or potentially damaging move during its cycle, gives the user great confidence in the output.

Productivity+[™] can also encourage or restore good working practice within a manufacturing environment. With probing now an integral part of the CAM process, the need for manual editing of probing cycles is removed.

For GibbsCAM users, the Productivity+[™] GibbsCAM plug-in is the obvious choice for the easy and swift addition of probing cycles to your metal cutting operations.



Renishaw OMV

On-machine verification software for machine tools

What is Renishaw OMV?

Renishaw OMV is a Microsoft Windows[™] compatible software package, which allows you to perform verification processes using your machine tool.

With Renishaw OMV, you can:

- Save time and money by verifying the part before moving it from the machine.
- Verify free-form surfaces and geometric features.
- Display captured data on the CAD model.
- Produce clear and detailed graphical reports.

Simple graphical reports and an online results display give you an instant indication of the match of your part to the CAD model, allowing instant Go/No-go decisions. Renishaw OMV also features comprehensive best fit and alignment functions, to minimise the set-up time required when returning parts to the machine after an external process.

Renishaw OMV probing cycles can be produced and simulated in the design office, increasing confidence on the shop floor and reducing prove out time. No direct PC connection is required to run the generated program on the machine tool; the points collected can be read back into the machine using a floppy disk, Ethernet, or RS232.

Renishaw OMV features – three simple steps...

1. Select

Renishaw OMV supports all the major 3D model types, importing into its proven CAD manipulation engine. The model is displayed from any angle and can be viewed in solid, in wireframe, or even transparently. Full support and manipulation of CAD levels allows sections of the model to be hidden when not required.

Selection of geometric features is as easy as clicking on them. The software also gives full control over probing strategies, with automatic or user-defined point positioning. Surface inspection is simple, too – use the mouse to choose points and the probe path is automatically generated using the rules you set.

The entire range of Renishaw machine tool inspection probes is supported in Renishaw OMV, and new styli can be constructed using the supplied database of Renishaw parts. Renishaw recommends the use of the patented OMP400 and MP700 probes, which give accurate, repeatable results every time.

2. Measure

Renishaw OMV uses stored calibration data from Renishaw Inspection Plus probe set-up routines to give the best possible metrology performance. It supports most major machine controllers through its versatile post-processing system.

If you are using a customised system, additional software is included to allow the output to be tailored to your needs.

Renishaw OMV can also transfer data via a serial line, Ethernet, or by floppy disk. When using RS232, instant feedback during point collection indicates whether the part is within acceptable limits by displaying coloured tolerance indicators on the CAD model.

3. Report

Renishaw OMV produces reports in a graphical format, giving you the fastest possible recognition of data and a visual cue to any necessary re-machining. Colour-coded output provides a clear and instant indication of the tolerance level for each point of your part, whilst plotted charts indicate the spread of the measurements.

For more detail, structured numerical reports can be configured to display selected key statistics about the part, derived from the data. The format of the reports can be configured to your needs, lending each report a professional and personalised quality.

With surface data points, Renishaw OMV can perform a bestfit algorithm to determine the maximum deviation within the part. If the part has been newly placed onto the machine tool, chosen features can be used to generate a point-line-plane alignment and the probe path can be exported using that alignment to ensure a perfect fit.



Renishaw OMV On-machine verification software for machine tools

CAD import

Renishaw OMV supports all the major 3D model types importing into its proven CAD manipulation engine. The model is displayed from any angle and can be viewed in solid, in wireframe, or even transparently. Full support and manipulation of CAD levels allows sections of the model to be hidden when not required.

- AutoCAD
- Cimatron*
- VDA/FS
- IGES
- Parasolids*
- ProE2000i2*
- ProE2001*
- ProE2001i*

- SDRC Ideas*
- SET
- Solid Edge*
- Solid Works*
- STEP
- WildFire*
- CATIA V5*

CAD import supported machine controllers

Renishaw OMV supports most major machine controllers through its versatile post-processing system. If you are using a customised system, additional software is included to allow the output to be tailored to your needs. If your controller type is not listed, please contact us:

- Fanuc
- Haas
- Heidenhain i530
 (controller options required)
- Hitachi Seiki
- Makino
- Mitsubishi Meldas

Mazak ISO

- Mori Seiki
- Siemens 840D

Selca

Custom design service

Total product service

- Design and manufacturing solutions based on Renishaw's knowledge and experience in product applications worldwide.
- Easy integration of Renishaw's probing products onto your machine.
- Best application of standard and custom products on customers' machines.
- Cost and delivery times minimised as standard parts are used where possible.

A team approach

The Styli and Custom Products Division is based at New Mills, Wotton-under-Edge, Gloucestershire, UK. It comprises a team that encompasses design, engineering, production and marketing, to ensure a comprehensive and efficient service.

Many years of experience in satisfying specific customer requirements exist within the group, which is backed by Renishaw's worldwide experience in probing related technology and applications.

The group works with Renishaw's customer support service, our distributors and ultimately our customer to ensure the most effective solution is found.

Access to Renishaw's custom design service

If your specialised needs cannot be met from the standard range of products, we will be pleased to make recommendations to your regular Renishaw supplier.

To help identify your particular needs, your supplier will assist you in completing a questionnaire. He will need full details of the specific application for which the system will be used, together with any environmental constraints. The make and model of the host machine tool must be specified, as should the required total accuracy of the probing system.

The required timescale is also important. The initial quantity and forecast of future requirements will naturally affect the final price quotation.









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Renishaw applies innovation to provide solutions to your problems

Renishaw is an established world leader in metrology, providing high performance, cost-effective solutions for measurement and increased productivity. A worldwide network of subsidiary companies and distributors provides exceptional service and support for its customers.

Renishaw designs, develops and manufactures products which conform to ISO 9001 standards.

Renishaw provides innovative solutions using the following products:

- Probe systems for inspection on CMMs (co-ordinate measuring machines).
- Systems for job set-up, tool setting and inspection on machine tools.
- Scanning and digitising systems.
- Laser and automated ballbar systems for performance measurement and calibration of machines.
- Encoder systems for high accuracy position feedback.
- Spectroscopy systems for non-destructive material analysis in laboratory and process environments.
- Styli for inspection and tool setting probes.
- Customised solutions for your applications.

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